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#### FAR FRONTIERS Fall 1985

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# **PREFACE**

Jerry Pournelle

In 1942 a coded cable was sent from Chicago to Washington, D.C. It said: "The Italian navigator has landed in the New World." It meant that the first man-made self-sustaining nuclear reaction had been created in a squash court in the University of Chicago's stadium.

The New World was the atomic age which has blessed us with the means either to kill ourselves or reach the stars. The "Italian Navigator" was Enrico Fermi, a refugee from Mussolini's Italy: when he left Italy to receive his Nobel Prize, he did not return.

Fermi was a great physicist and mathematician. He liked to apply his knowledge to questions which seemed unanswerable, yet which could be attacked with a few facts. One example: How many piano tuners were there in Chicago? Fermi reasoned from the average income In the U.S. and some reasonable guesses about how many households in Chi-

cago had pianos. His answer was fairly close to the answer obtained by looking at the Yellow Pages.

Fermi had a habit of asking such strange questions. One day he might try to reason how many hairs were on a human head; on another, how

many tennis balls can be packed into a suitcase.

One evening after dinner he asked what may be the most important question in human history.

Fermi reasoned as follows. There are hundreds of billions of stars in our galaxy. If even one percent of them have planets, there are a billion stars with planets. If one percent of those have inhabitable planets, there are millions of inhabitable planets, If one percent of those evolved life, there are hundreds of thousands to millions of planets supporting life.

It is clear that nuclear energy makes interstellar travel possible. Half those life-bearing planets will be older then Earth by millions of years. There should be thousands of alien races capable of exploring the galaxy who have had millions of years

to do so.

Where are they?

The scientific establishment has refused to take Fermi's question seriously. Some individual scientists agree it's an important question, and a few are willing to publish on the subject, but most are frightened of ridicule. Even the pro-space L-5 News—house organ of a group that wants to build colonies in space—rejected an article by Robert Bussard, and its editor said in private that no one would take L-5 seriously if it published pieces about flying saucers and little green men.

We need not concern ourselves with little green men or big purple women and still take Fermi's question seriously. Where are they? Even if they do not care to travel to Earth, it is very clear that they can make their existence unambiguously known across interstellar distances, for the United States could do so now if we seriously wanted to.

There have been a few serious speculations about Fermi's inquiry; enough that most tentative answers can be classified under a few headings. For

example:

## The Quarantine Hypothesis

For some reason we must be kept unaware of

the larger galactic civilization.
Humanity as protected species.

Earth as hunting preserve.

We're property.

We're protected by anthropologists.

#### The Empty Universe

For some reason we are alone in the universe.

There are no other intelligent civilizations.

They're all robots and avoid life planets.

Intelligence eliminates itself: ants and bees are the model for universal life.

Planets are rarer than Fermi knew.

Genesis was right and we're a special creation. Life is more improbable than we believe. Intelligence is counterproductive to survival.

That final hypothesis is one that concerns us all: Is it true that intelligence is inevitably coupled with aggressiveness, so that when a species acquires the technical capability to navigate to the stars, it automatically destroys itself? Carl Sagan, among others, takes this notion seriously. The only remedy, he says, is the hoof and mouth disease remedy; if there isn't any hoof and mouth disease.

there won't be any hoof and mouth disease. The remedy is to eliminate all nuclear weapons, and particularly to keep them out of space.

Alas, the only nuclear weapons we have the power to eliminate (other than through war) are our own: to eliminate them is to rely on the good will of the masters of the gulag. Americans seem unwilling to do this.

The year 1985 could be highly significant. This is, we believe, the year in which certain propositions will finally be taken seriously; and when that happens, human history will be changed forever.

The propositions we believe important are:

1. Fermi's question must be taken seriously.

2. ICBM's and nuclear weapons can be made obsolete and impotent through the development and deployment of strategic defense systems. It will not be an easy task, but a start can be made.

3. The natural course of human history is to mire itself in bureaucracy. Economic quantum leaps, such as the discovery of the Americas, the invention of the steam engine, the cybernetics revolution, and the discovery of the economic value of space resources can significantly change that doom. Taking free people to space is not merely desirable, but vital for the future of the human race,

The year 1992 will be:

The 500th anniversary of Columbus's voyage. The 75th anniversary of the Soviet Revolution.

The 50th anniversary of the first "atomic pile.

That is not very far away.

# EDITOR'S INTRODUCTION TO: THE UNGOVERNED

by Vernor Vinge

Vernor Vinge's important novel *The Peace War* explored the social and political consequences of a number of intriguing technological developments. "The Ungoverned" takes place in the "Peace War" universe some years later.

For freedom to survive, free men and women must survive. The affluence that accompanies freedom is not a requirement, but a very pleasant side effect. Given freedom, wealth follows; take freedom away, and there will be wealth only for masters. However: if we contemplate Fermi's question we may conclude that intelligent free species do not survive. So much seems obvious.

I have said elsewhere (see Jerry Pournelle and Dean Ing, Mutual Assurd Survival, Base Books 1984, ISBN 0-671-55923-0) that mankind's best hope is for the United States, and Western Civilization, to get off the weary treadmill of the MacNamara strategy of Mutual Assured Destruction (MAD) and adopt a new strategy of Mutual Assured Survival. Such a new strategy may not automatically give us the libertarian utopia hinted at in "The Ungow.

erned," but without Assured Survival we will most assuredly lose what liberties we have.

# THE UNGOVERNED

# Vernor Vinge

Al's Protection Racket operated out of Manhattan, Kansas. Despite the name, it was a small, insurance-oriented police service with about 20,000 customers, all within 100 kilometers of the main ship. But apparently "Al" was some kind of humorist: His ads had a gangster motif with his cops dressed like 20th century hoodlums. Wil Brierson guessed that it was all part of the nostalgia thing. Even the Michigan State Police—Wil's outfit—capitalized on the public's feeling of trust for old names, old traditions.

Even so, there's something more dignified about a company with a name like "Michigan State Police," thought Brierson as he brought his filer down on the pad next to Al's HO. He stepped out of the cockpit into an eerie morning silence: It was close to sunrise, yet the sky remained dark, the air humid. Thunderheads marched around half the horizon. A constant flicker of lightning chased back



and forth within those clouds, yet there was not the faintest sound of thunder. He had seen a tornado killer on his way in, a lone eagle in the far sky. The weather was almost as ominous as the plea East Lansing HQ had received from Al's just four hours earlier.

A spindly figure came bouncing out of the shadows. "Am I glad to see you! The name's Alvin Swensen. I'm the proprietor." He shook Wil's hand enthusiastically. "I was afraid you might wait till the front passed through." Swensen was dressed in baggy pants and a padded jacket that would have made Frank Nitti proud. The local police chief urged the other officer up the steps. No one else was outside; the place seemed just as deserted as one might expect a rural police station to be early on a weekday morning. Where was the emergency?

Inside, a clerk (cop?) dressed very much like Al sat before a commo console. Swensen grinned at the other. "It's the MSP, all right. They're really coming, Jim. They're really coming! Just come down the hall, Lieutenant. I got my office back there. We should clear out real soon, but for the moment, I

think it's safe.'

Wil nodded, more puzzled than informed. At the far end of the hall, light spilled from a half-open door. The frosted glass surface was stenciled with the words "Big Al." A faint smell of mildew hung over the aging carpet and the wood floor beneath settled perceptibly under Wil's 90 kilo tread. Brierson almost smiled: maybe Al wasn't so crazy. The gangster motif excused absolutely slovenly maintenance. Few customers would trust a normal police organization that kept its buildings like this.

Big Al urged Brierson into the light and waved

him to an overstuffed chair. Though tall and angular, Swensen looked more like a school teacher than a cop-or a gangster. His reddish-blond hair stood out raggedly from his head, as though he had been pulling at it, or had just been wakened. From the man's fidgety pacing about the room, Wil guessed the first possibility more likely. Swensen seemed about at the end of his rope, and Wil's arrival was some kind of reprieve. He glanced at Wil's name plate and his grin spread even further. "W. W. Brierson, I've heard of you, I knew the Michigan State Police wouldn't let me down: they've sent their best."

Wil smiled in return, hoping his embarrassment didn't show. Part of his present fame was a company hype that he had come to loathe. "Thank you, uh, Big Al. We feel a special obligation to small police companies that serve no-right-to-beararms customers. But you're going to have to tell me more. Why so secretive?"

Al waved his hands. "I'm afraid of blabbermouths. I couldn't take a chance on the enemy learning I was bringing you into it until you were on the scene and in action."

Strange that he says "enemy," and not "crooks" or "bastards" or "hustlers." "But even a large gang

might be scared off knowing-"

"Look, I'm not talking about some punk gang. I'm talking about the Republic of New Mexico. Invading us." He dropped into his chair and continued more calmly. It was almost as if passing the information on had taken the burden off him. "You're shocked?"

Brierson nodded dumbly.

"Me, too, Or I would have been up till a month ago. The Republic has always had plenty of internal troubles. And even though they claim all lands south of the Arkansas River, they have no settlements within hundreds of kilometers of here. Even now I think this is a bit of adventurism that can be squelched by an application of point force." He glanced at his watch. "Look, no matter how important speed is, we've got to do some coordinating. How many attack patrols are coming in after you?"

He saw the look on Brierson's face. "What? Only one? Damn. Well, I suppose it's my fault, being secret like, but—"

Wil cleared his throat. "Big Al, there's only me.

I'm the only agent MSP sent.

The other's face seemed to collapse, the relief changing to despair, then to a weak rage. "G-God d-damn you to hell, Brierson. I may lose everything I've built here, and the people who trusted me may lose everything they own. But I swear I'm going to sue your Michigan State Police into oblivion. Fifteen years I've paid you guys premiums and never a claim. And now when I need max firepower, they send me one asshole with a 10-millimeter popgun."

Brierson stood, his nearly two-meter bulk towering over the other. He reached out a bearlike hand
to Al's shoulder. The gesture was a strange cross
between reassurance and intimidation. Wil's voice
was soft but steady. "The Michigan State Police
hasn't let you down, Mr. Swensen. You paid for
protection against wholesale violence—and we intend to provide that protection. MSP has never
defaulted on a contract." His grip on Alvin Swensen's shoulder tightened with these last words.
The two eyed each other for a moment. Then Big
Al nodded weakly, and the other sat down.

"You're right. I'm sorry. I'm paying for the re-

sults, not the methods. But I know what we're up

against, and I'm damned scared."

"And that's one reason why I'm here, Al: to find out exactly what we're up against before we jump in with our guns blazing and our pants down.

What are you expecting?"

Al leaned back in the softly creaking chair. He looked out through the window into the dark silence of the morning, and for a moment seemed to relax. However improbably, someone else was going to take on his problems. "They started about three vears ago. It seemed innocent enough, and it was certainly legal." Though the Republic of New Mexico claimed the lands from the Colorado on the west to the Mississippi on the east, and north to the Arkansas, in fact, most of their settlements were along the Gulf Coast and Rio Grande, For most of a century, Oklahoma and northern Texas had been uninhabited. The "border" along the Arkansas River had been of no real concern to the Republic, which had plenty of problems with its Water Wars on the Colorado, and of even less concern to the farmers at the southern edge of the ungoverned lands. During the last 10 years, immigration from the Republic toward the more prosperous north had been steadily increasing. Few of the southerners staved in the Manhattan area: most jobs were farther north. But during these last three years, wealthy New Mexicans had moved into the area, men willing to pay almost any price for farmland.

"It's clear now that these people were stooges for the Republic government. They paid more money than they could reasonably recoup from farming, and the purchases started right after the election of their latest president. You know—Hastings Whatever-his-name-is. Anyway, it made a pleasant boom time for a lot of us. If some wealthy New Mexicans wanted isolated estates in the ungoverned lands, that was certainly their business. All the wealth in New Mexico couldn't buy one tenth of Kansas, anyway." At first, the settlers had been model neighbors. They even signed up with Al's Protection Racket and Midwest Jurisprudence. But as the months passed, it became obvious that they were neither farmers nor leisured rich. As near as the locals could figure out, they were some kind of labor contractors. An unending stream of trucks brought raggedly dressed men and women from the cities of the south: Galveston, Corpus Christi, even from the capital, Albuquerque, These folk were housed in barracks the owners had built on the farms. Anyone could see, looking in from above, that the newcomers spent long hours working in the fields.

Those farms produced on a scale that surprised the locals, and though it was still not clear that it was a profitable operation, there was a ripple of interest in the Grange journals; might manual labor hold an economic edge over the automatic equipment rentals? Soon the workers were hiring out to local farmers. "Those people work harder than any reasonable person, and they work dirt cheap. Every night, their contract bosses would truck 'em back to the barracks, so our farmers had scarcely most overhead than they would with automatics. Overall, the NMs underbid the equipment rental

people by five percent or so.'

Wil began to see where all this was leading. Someone in the Republic seemed to understand Midwest Jurisprudence. "Hmm, you know, Al, if I were one of those laborers, I wouldn't hang around in farm country. There are labor services up north that can get an apprentice butler more money

than some rookie cops make. Rich people will always want servants, and nowadays the pay is tremendous."

Big Al nodded. "We've got rich folks, too. When they saw what these newcomers would work for. they started drooling. And that's when things began to get sticky." At first, the NM laborers could scarcely understand what they were being offered. They insisted that they were required to work when and where they were told. A few, a very few at first, took the job offers. "They were really scared, those first ones. Over and over, they wanted assurances that they would be allowed to return to their families at the end of the work day. They seemed to think the deal was some kidnap plot rather than an offer of employment. Then it was like an explosion: they couldn't wait to drop the farm jobs. They wanted to bring their families with them

"And that's when your new neighbors closed up

the camps?"

"You got it, pal. They won't let the families out. And we know they are confiscating the money the workers bring in."

"Did they claim their people were on long-term

contracts?"

"Hell, no. It may be legal under Justice, Inc., but indentured servitude isn't under Midwest—and that's who they signed with. I see now that even

that was deliberate.

"It finally hit the fan yesterday. The Red Cross flew a guy out from Topeka with a writ from a Midwest judge: He was to enter each of the settlements and explain to those poor folks how they stood with the law. I went along with a couple of my boys. They refused to let us in and punched out the Red Cross fellow when he got insistent.

Their chief thug—fellow named Strong—gave me a signed policy cancellation, and told me that from now on they would handle all their own police and justice needs. We were then escorted off the property—at gunpoint."

"So they've gone armadillo. That's no problem. But the workers are still presumptively customers

of yours?"

"Not just presumptively. Before this blew up, a lof of them had signed individual contracts with me and Midwest. The whole thing is a setup, but I'm stuck."

Wil nodded. "Right. Your only choice was to call in someone with firepower, namely my com-

pany."

Big Al leaned forward, his indignation retreating before fear. "Of course. But there's more, Lieutenant. Those workers—those slaves—were part of the trap that was set for us. But most of them are brave, honest people. They know what's happening, and they aren't any happier about it than I am. Last night, after we got our butts kicked, three of them escaped. They walked fifteen kilometers into Manhattan to see me, to beg me not to intervene. To beg me not to honor the contract.

"And they told me why: For a hundred kilometer stretch of their truck ride up here, they weren't allowed to see the country they were going through. But they heard plenty. And one of them managed to work a peephole in the side of the truck. He saw armored vehicles and attack aircraft under heavy camouflage just south of the Arkansas. The damn New Mexicans have taken part of their Texas garrison force and holed it up less than ten minutes flying time from Manhattan. And they're ready to move."

It was possible. The Water Wars with Aztlán

had been winding down these last few years. The New Mexicans should have equipment reserves, even counting what they needed to keep the Gulf Coast cities in line. Wil got up and walked to the window. Dawn was lighting the sky above the far cloud banks. There was green in the rolling land that stretched away from the police post. Suddenly he felt very exposed here: Death could come out of that sky with precious little warning. W. W. Brierson was no student of history, but he was an old-time movie freak, and he had seen plenty of war stories. Assuming the aggressor had to satisfy some kind of public or world opinion, there had to be a provocation, an excuse for the massive violence that would masquerade as self-defense. The New Mexicans had cleverly created a situation in which Wil Brierson-or someone like him-would be contractually obligated to use force against their settlements.

"So. If we hold off on enforcement, how long do you think the invasion would be postponed?" If hurt to suggest bending a contract like that, but there was precedent: In hostage cases, you often

used time as a weapon.

"It wouldn't slow 'em up a second. One way or another they're moving on us. I figure if we don't do anything, they'll use my 'raid' yesterday as their excuse. The only thing I can see is for MSP to put everything it can spare on the line when those bastards come across. That sort of massive resistance might be enough to scare 'em back."

Brierson turned from the window to look at Big Al. He understood now the shaking fear in the other. It had taken guts for the other to wait here through the night. But now it was W. W. Brierson's baby. "Okay, Big Al. With your permission, I'll

take charge.

"You got it, Lieutenant!" Al was out of his chair,

a smile splitting his face.

Wil was already starting for the door. "The first thing to do is get away from this particular ground zero. How many in the building?"

"Just two besides me."

"Round 'em up and bring them to the front room. If you have any firearms, bring them, too."

Wil was pulling his comm equipment out of the gunship when the other three came out the front door of Al's HQ and started toward him. He waved them back. "If they play as rough as you think, they'll grab for air superiority first thing. What

kind of ground vehicles do you have?"

"Couple of cars. A dozen motorbikes. Jim, open up the garage." The zoot-suited trooper hustled off. Will looked with some curiosity at the person remaining with Al. This individual couldn't be more than 14 years old. She (?) was weighted down with five boxes, some with makeshift carrying straps, others even less portable. Most looked like communications gear. The kid was grinning from ear to ear. Al said, "Kiki van Steen, Lieutenant. She's a war-game fanatic—for once, it may be worth something."

"Hi, Kiki,"

"Pleased to meetcha, Lieutenant." She half-lifted one of the suitcase-size boxes, as though to wave. Even with all the gear, she seemed to vibrate with excitement.

"We have to decide where to go, and how to get there. The bikes might be best, Al. They're small

enough to-

"Nah." It was Kiki. "Really, Lieutenant, they're almost as easy to spot as a farm wagon. And we don't have to go far. I checked a couple minutes

ago, and no enemy aircraft are up. We've got at least five minutes.

He glanced at Al, who nodded. "Okay, the car it is "

The girl's grin widened and she waddled off at high speed toward the garage. "She's really a good kid, Lieutenant, Divorced though, She spends most of what I pay her on that war-game equipment. Six months ago she started talking about strange things down south. When no one would listen, she shut up. Thank God she's here now. All night she's been watching the south. We'll know the second they iump off.

"You have some hidev-hole already set, Al?"

"Yeah. The farms southwest of here are riddled with tunnels and caves. The old Fort Riley complex. Friend of mine owns a lot of it. I sent most of my men out there last night. It's not much, but at least they won't be picking us up for free."

Around them insects were beginning to chitter, and in the trees west of the HO there was a dove. Sunlight lined the cloud tops. The air was still cool, humid. And the darkness at the horizon remained. Twister weather. Now who will benefit from that?

The relative silence was broken by the sharp coughing of a piston engine. Seconds later, an incredible antique nosed out of the gargage onto the driveway. Wil saw the long black lines of a pre-1950 Lincoln. Brierson and Big Al dumped their guns and comm gear into the back seat and piled in.

This nostalgia thing can be carried too far, Wil thought. A restored Lincoln would cost as much as all the rest of Al's operation. The vehicle pulled smoothly out onto the ag road that paralleled the HQ property, and Wil realized he was in an inex-

pensive reproduction. He should have known Big Al would keep costs down.

Behind him the police station dwindled, was soon lost in the rolling Kansas landscape. "Kiki. Can you get a line-of-sight on the station's mast?"

The girl nodded. "Okay. I want a link to East Lansing that looks like it's coming from your stationhouse."

"Sure." She phased an antenna ball on the mast, then gave Wil her command mike. In seconds he had spoken the destination codes and was talking first to the duty desk in East Lansing-and then to Colonel Potts and several of the directors.

When he had finished, Big Al looked at him in awe. "One hundred assault aircraft! Four thousand troopers! My God, I had no idea you could

call in that sort of force."

Brierson didn't answer immediately. He pushed the mike into Kiki's hands and said, "Get on the loudmouth channels, Kiki, Start screaming bloody murder to all North America." Finally he looked back at Al, embarrassed. "We don't, Al, MSP has maybe thirty assault aircraft, twenty of them helicopters. Most of the fixed-wing jobs are in the Yukon. We could put guns on our search and rescue ships-we do have hundreds of those-but it will take weeks.

Al paled, but the anger he had shown earlier was

gone. "So it was a bluff?"

Wil nodded. "But we'll get everything MSP has, as fast as they can bring it in. If the New Mexican investment isn't too big, this may be enough to scare 'em back." Big Al seemed to shrink in on himself. He gazed listlessly over Jim's shoulder at the road ahead. In the front seat, Kiki was shrilly proclaiming the details of the enemy's movements, the imminence of their attack. She was transmitting call letters and insignia that could leave no doubt that her broadcast came from a legitimate

police service.

The wind whipped through the open windows brought the lush smells of dew and things dark green. In the distance gleamed the silver dome of a farm's fresh produce bobble. They passed a tiny Methodist church, sparkling white amidst flowers and lawn. In back, someone was working in the pastor's garden.

The road was just good enough to support the big tires of farm vehicles. Jim couldn't do much over 50 kph. Every so often, a wagon or tractor would pass them going the other way—going off to work in the fields. The drivers waved cheerfully at the Lincoln. It was a typical farm country morning in the ungoverned lands. How soon it would change. The news networks should have picked up on Kiki by now. They would have their own investigative people on the scene in hours with live holo coverage of whatever the enemy chose to do. Their programming, some if it directed into the Republic, might be enough to turn the enemy's public opinion against its government. Wishful thinking.

More likely the air above them would soon be filled with screaming metal—the end of a genera-

tion of peace.

Big Al gave a short laugh. When Wil looked at him questioningly, the small-town cop shrugged. "I was just thinking. This whole police business is something like a lending bank. Instead of gold, MSP backs its promises with force. This invasion is like a run on your 'bank of violence.' You got enough backing to handle normal demands, but when it all comes due at once..."

... you wind up dead or enslaved. Wil's mind shied away from the analogy. "Maybe so, but like

a lot of banks, we have agreements with others. I'll bet Portland Security and the Mormons will loan us some aircraft. In any case, the Republic can never hold this land. You run a no-right-to-beararms service; but a lot of people around here are armed to the teeth."

"Sure. My biggest competitor is Justice, Inc. They encourage their customers to invest in handguns and heavy home security. Sure. The Republic will get their asses kicked eventually. But we'll be dead and bankrupt by then—and so will a few thousand other innocents."

Al's driver glanced back at them. "Hey, Lieutenant, why doesn't MSP pay one of the big power companies to retaliate—bobble places way inside the Republic?"

Wil shook his head. "The New Mexico government is sure to have all its important sites protected by Wáchendon suppressors."

Suddenly Kiki broke off her broadcast monologue and let out a whoop. "Bandits! Bandits!" She handed a display flat over the seat to Al. The format was familiar, but the bouncing, jostling ride made it hard to read. The picture was based on a sidelooking radar view from orbit, with a lot of data added. Green denoted vegetation and pastel overlays showed cloud cover. It was a jumble till he noticed that Manhattan and the Kansas River were labeled. Kiki zoomed up the magnification. Three red dots were visibly accelerating from a growing pockwork of red dots to the south. The three brightened, still accelerating, "They just broke cloud cover," she explained. Beside each of the dots a moving legend gave what must be altitude and speed.

"Is this going out over your loudmouth channel?"
She grinned happily, "Sure is! But not for long."

She reached back to point at the display. "We got about two minutes before Al's stationhouse goes boom. I don't want to risk a direct satellite link from the car, and anything else would be even more dangerous."

Point certain, thought Wil.

"Geez, this is incredible, just incredible. For two years the Warmongers—that's my club, you know—been watching the Water Wars. We got software, hardware, cryptics—everything to follow what's going on. We could predict, and bet other clubs, but we could never actually participate. And now we have a real war, right here!" She lapsed into awed silence, and Wil wondered fleetingly if she might be psychopathic, and not merely young and naive.

"Do you have outside cameras at the police station?" He was asking Kiki as much as Al. "We should broadcast the actual attack."

The girl nodded. "I grabbed two channels. I got the camera on the comm mast pointing southwest. We'll have public opinion completely nailed on this."

"Let's see it."

She made a moue. "Okay. Not much content to it, though." She flopped back onto the front seat. Over her shoulder, Wil could see she had an outsized display flat on her lap. It was another composite picture, but this one was overlaid with cryptic legends. They looked vaguely familiar, then he recognized them from the movies: They were the old, old shorthand for describing military units and capabilities. The Warmongers Club must have software for translating multispec satellite observations into such displays. Hell, they might even be able to listen in on military communications. And what the girl had said about public opinion—

the club seemed to play war in a very universal way. They were crazy, but they might also be damned useful.

Kiki mumbled something into her command mike, and the flat Al was holding split down the middle: On the left they could follow the enemy's approach with the map; on the right they saw blue sky and farmland and the parking lot by the stationhouse. Wil saw his gunship gleaming in the morning sunlight, just a few meters below the camera's viewpoint.

"Fifteen seconds. They might be visible if you

look south."

The car swerved toward the shoulder as Jim pointed out the window. "I see 'em!"

Then Wil did, too. A triple of black insects, silent because of distance and speed. They drifted westward, disappeared behind trees. But to the camera on the comm mast, they did not drift: They seemed to hang in the sky above the parking lot, death seen straight on. Smoke puffed from just beneath them and things small and black detached from the bodies of the attack craft, which now pulled up. The planes were so close that Wil could see shape to them, could see sun glint from canopies. Then the bombs hit.

Strangely, the camera scarcely jolted, but started slowly to pan downward. Fire and debris roiled up around the viewpoint. A rotor section from his flier flashed past, and then the display went gray. He realized that the panning had not been deliberate: The high comm mast had been severed and was toppling.

Seconds passed and sharp thunder swept over the car, followed by the fast-dying scream of the bombers climbing back into the sky. "So much for the loudmouth channels," said Kiki. "I'm for keeping quiet till we get underground."

Jim was driving faster now He hadn't seen the display, but the sounds of the explosions were enough to make all but the least imaginative run like hell. The road had been bumpy, but now seemed like washboard. Wil gripped the seat ahead of him. If the enemy connected them with the broadcasts . . .

"How far, Al?"

"Nearest entrance is about four kilometers as the crow flies, but we gotta go all around the Schwartz farm to get to it." He waved at the high, barbed-wire fence along the right side of the road. Corn fields stretched away north of it. In the distance, Wil saw something—a harvester?—amidst the green. "It'll take us fifteen minutes—"

"Ten!" claimed Jim emphatically, and the ride

became still wilder.

"-to make it around the farm."

They crested a low hill. Not more than 300 meters distant, Wil could see a side road going directly north. "But we could take that."

"Not a chance. That's on Schwartz land." Big Al glanced at the state trooper. "And I ain't just being law-abiding, Lieutenant. We'd be as good as dead to do that. Jake Schwartz went armadillo about three years ago. See that hulk out there in the field?" He tried to point, but his arm waved wildly.

"The harvester?

"That's no harvester. It's armor. Robot, I think. If you look careful you may see the gun tracking us." Wil looked again. What he had thought was a chaff exhaust now looked more like a high-velocity catapult.

Their car zipped past the T-intersection with the Schwartz road; Wil had a glimpse of a gate and keep-out signs surmounted by what looked like human skulls. The farm west of the side road seemed undeveloped. A copse at the top of a near hill might have hid farm buildings.

"The expense. Even if it's mostly bluff-"

"It's no bluff. Poor Jake. He always was selfrighteous and a bit of a bully. His police contract was with Justice. Inc., and he claimed even they were too bleedin' heart for him. Then one night his kid-who's even stupider than Jake-got pig drunk and killed another idiot. Unfortunately for Jake's boy, the victim was one of my customers. There are no amelioration clauses in the Midwest/Justice, Inc. agreements. Reparations aside, the kid will be locked up for a long time. Jake swore he'd never contract his rights to a court again. He has a rich farm, and since then he's spent every gAu from it on more guns, more traps, more detectors. I hate to think how they live in there. There are rumors he's brought in deathdust from the Hanford ruins. just in case anybody succeeds in getting past everything else."

Oh boy. Even the armadillos up north rarely went

that far.

The last few minutes Kiki had ignored them, all her attention on the strategy flat on her lap. She wore a tiny headset and was mumbling constantly into her command mike. Suddenly she spoke up. "Oops. We're not going to make it, Big Al." She began folding the displays, stuffing them back into her equipment boxes. "I monitored. They just told their chopper crews to pick us up. They got us spotted easy. Two, three minutes is all we have."

Jim slowed, shouted over his shoulder. "How about if I drop you and keep going? I might be kilometers gone before they stop me." Brierson

had never noticed any lack of guts among the

unarmed police services.

"Good idea! Bye!" Kiki flung open her door and rolled off into the deep and apparently soft vegetation that edged the road.

"Kiki!" screamed Big Al, turning to look back down the road. They had a brief glimpse of comm and processor boxes bouncing wildly through the brush. Then Kiki's blond form appeared for an instant as she dragged the equipment deeper into the green.

From the trees behind them they could hear the thup thupthup of rotors. Two minutes had been an overstatement. Wil leaned forward, "No, Jim. Drive like hell. And remember: There were only three of

us.'

The other nodded. The car squealed out toward the center of the road, and accelerated up past 80. The roar and thump of their progress momentarily drowned out the sound of pursuit. Thirty seconds passed, and three helicopters appeared over the tree line behind them. Do we get what they gave the stationhouse? An instant later white flashed from their belly guns. The road ahead erupted in a gevser of dirt and rock. Jim stepped on the brakes and the car swerved to a halt, dipping and bobbing among the craters left by the shells. The car's engine died and the thumping of rotors was a loud, almost physical pressure around them. The largest craft settled to earth amidst its own dust devil. The other two circled, their autocannons locked on Big Al's Lincoln.

The passenger hatch on the grounded chopper still back and two men in body armor hopped out. One waved his submachine gun at them, motioning them out of the car. Brierson and the others were hustled across the road, while the second soldier went to pick up the equipment they had in the car. Wil looked back at the scene, feeling the dust in his mouth and on his sweating face—the ashes of humiliation.

His pistol was pulled from its holster. "All aboard, gentlemen." The words were spoken with a clipped,

Down West accent.

Wil was turning when it happened. A flash of fire and a muffled thud came from one of the hovering choppers. Its tail rotor disappeared in a shower of debris. The craft spun uncontrollably on its main rotor and fell onto the roadway behind them. Pale flame spread along fuel lines, sputtering in small explosions. Wil could see injured crew trying to crawl out.

"I said get aboard." The gunman had stepped back from them, his attention and the muzzle of his gun still on his captives. Wil guessed the man was a veteran of the Water Wars—that institution-alized gangsterism that New Mexico and Aztlán called "warfare between nations." Once given a mission, he would not be distracted by incidental

catastrophes.

The three "prisoners of war" stumbled into the relative darkness of the helicopter's interior. Wil saw the soldier—still standing outside—look back toward the wreck, and speak emphatically into his helmet mike. Then he hopped on and pulled the hatch to. The helicopter slid into the air, hanging close to the ground as it gradually picked up speed. They were moving westward from the wreck, and there was no way they could look back through the tiny windows.

An accident? Who could have been equipped to shoot down an armored warcraft in the middle of Kansas fields? Then Wil remembered: Just before it lost its tail, the chopper had drifted north of the

roadway, past the high fence that marked Armadillo Schwartz's land. He looked at Big Al, who nodded slightly. Brierson sat back in the canvas webbing and suppressed a smile. It was a small thing on the scale of the invasion, but he thanked God for armadillos. Now it was up to organizations like the Michigan State Police to convince the enemy that this was just the beginning, that every kilometer into the ungoverned lands would cost them similarly.

One hundred and eighty kilometers in six hours. Republican casualties: one motorcycle/truck collision, and one helicopter crash—that probably a mechanical failure. Edward Strong, Special Advisor to the President, felt a satisfied smile come to his lips every time he glanced at the situation board. He had seen more casualties on a Freedom Day parade through downtown Albuquerque. His own analysis for the President—as well as the larger, less imaginative analysis from JCS—had predicted that extending the Republic through Kansas to the Mississippi would be almost trivial. Nevertheless, after having fought meter by bloody meter with the fanatics of Aztlán, it was a strange feeling to be advancing hundreds of kilometers each day.

Strong paced down the narrow aisle of the Command and Control van, past the analysts and clerks. He stood for a moment by the rear door, feeling the air-conditioning billow chill around his head. Camouflage netting had been laid over the van, but he could see through it without difficulty: Green leaves played tag with shadows across pale yellow limestone. They were parked in a wooded creek bed on the land Intelligence had bought several years earlier. Somewhere to the north were the barracks that now confined the people Intelligence

had imported, allegedly to work the farms. Those laborers had provided whatever legal justification was needed for this move into the ungoverned lands. Strong wondered if any of them realized their role—and realized that in a few months they would be free of poverty, realized that they would own farms in a land that could be made infinitely more hospitable than the deserts of the Southwest.

Sixteen kilometers to the northeast lay Manhattan. It was a minor goal, but the Republic's forces were cautious. It would be an important—though small—test of their analysis. There were Tinkers in that town and in the countryside beyond. The precision electronics and related weapons that came out of the Tinkers' shops were worthy of respect and caution. Privately, Strong considered them to be the only real threat to the success of the invasion he had proposed to the President three years earlier. (Three years of planning, of cajoling resources from other departments, of trying to inject imagination into minds that had been closed for decades. By far, the easiest part had been the operations here in Kansas.)

The results of the move on Manhattan would be relayed from here to General Crick at the head of the armor driving east along Old70. Later in the afternoon, Crick's tank carriers should reach the outskirts of Topeka. The Old U.S. highway provided a mode of armored operations previously unknown to warfare. If the investiture of Manhattan went as planned, then Crick might have Topeka by nightfall and be moving the remainder of his forces on to the Mississippi.

Strong looked down the van at the time posted on the situation board. The President would be calling in 20 minutes to witness the move against Manhattan. Till then, a lull gapped in Strong's schedule. Perhaps there was time for one last bit of caution. He turned to the bird colonel who was his military liaison. "Bill, those three locals you picked up-you know, the protection racket people-I'd like to talk to them before the Chief calls in."

"Here?" "If possible,"

"Okay." There was faint disapproval in the officer's voice. Strong imagined that Bill Alvarez couldn't quite see bringing enemy agents into the C&C van. But what the hell, they were clean-and there was no way that they could report what they saw here. Besides, he had to stay in the van in case

the Old Man showed up early.

Minutes later, the three shuffled into the conference area at the front of the van. Restraints glinted at their hands and ankles. They stood in momentary blindness in the darkness of the van, and Strong had a chance to look them over; three rather ordinary human beings, dressed in relatively extraordinary ways. The big black wore a recognizable uniform, complete with badges, sidearm holster, and what appeared to be riding boots. He looked the model fascist. Strong recognized the Michigan State "Police" insignia on his sleeve. MSP was one of the most powerful gangster combines in the ungoverned lands. Intelligence reported they had some modern weapons-enough to keep their "clients" in line, anyway.

"Sit down, gentlemen." Amidst a clanking of shackles, the three sat, sullen, Behind them an armed guard remained standing. Strong glanced at the intelligence summary he had punched up. "Mr., uh, Lieutenant Brierson, you may be interested to know that the troops and aircraft you asked your bosses for this morning have not materialized. Our intelligence people have not changed their estimate that you were making a rather weak bluff."

The northerner just shrugged, but the blond fellow in the outrageously striped shirt—Alvin Swensen, the report named him—leaned forward and almost hissed. "Maybe, maybe not, Asshole! But it doesn't matter. You're going to kill a lot of people, but in the end you'll be dragging your bloody tail back south."

Figuratively speaking, Strong's ears perked up.

"How is that, Mr. Swensen?"

"Read your history. You're stealing from a free people now—not a bunch of Aztlán serfs. Every single farm, every single family is against you, and these are educated people, many with weapons. It may take a while. It may destroy a lot of things we value. But every day you stay here, you'll bleed. And when you've bled enough to see this, then you'll go home."

Strong glanced at the casualty report on the situation board, and felt laughter stealing up." You poor fool. What free people? We get your video, your propaganda, but what does it amount to? There hasn't been a government in this part of the continent for more than eighty years. You petty gangsters have the guns and have divided up the territory. Most of you don't even allow your 'clients' firearms. I'll wager that the majority of your victims will welcome a government where there is a franchise to be exercised, where ballots, and not MSP bullets, decide issues.

"No, Mr. Swensen, the little people in the ungoverned lands have no stake in your status quo. And as for the armed groups fighting some kind of guerrilla war against us—Well, you've had it easier than you know for a long time. You haven't lived in a land as poor as old New Mexico. Since the Bobble War, we've had to fight for every liter of water, against an enemy far more determined and bloodthirsty than you may imagine. We have prevailed, we have revived and maintained democratic government, and we have remained free men."

"Sure. Free like the poor slobs you got locked up over there." Swensen waved in the direction of the

workers' barracks.

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Strong leaned across the narrow conference table to pin Swensen with his glare. "Mister, I grew up as one of 'those slobs.' In New Mexico, even people that poor have a chance to get something better. This land you claim is practically empty—you don't know how to farm it, you don't have a government to manage large dam and irrigation projects, you don't even know how to use government agriculture policy to encourage its proper use by individuals.

"Sure, those workers couldn't be told why they were brought here. But when this is over, they will be heroes, with homesteads they had never imag-

ined being able to own.

Swensen rocked back before the attack, but was plainly unconvinced. Which makes sense, thought Strong. How can a wolf imagine anyone sincerely

wishing good for sheep?

An alert light glowed on Strong's display and one of the clerks announced, "Presidential transmission under way, Mr. Strong." He swore behind his teeth. The Old Man was early. He'd hoped to get some information out of these three, not just argue politics.

A glowing haze appeared at the head of the conference table and quickly solidified into the image of the fourth President of the Republic. Hastings Martinez was good-looking with bio-age around 50 years-old enough to inspire respect, young enough to appear decisive. In Strong's opinion, he was not the best president the Republic had seen, but he had the advisor's respect and lovalty nevertheless. There was something in the very responsibility of the office of the Presidency that made its holder larger than life.

"Mr. President," Strong said respectfully.

"Ed," Martinez's image nodded. The projection was nearly as substantial as the forms of those truly present; Strong didn't know whether this was because of the relative darkness within the van, or because Martinez was transmitting via fiber from his estate in Alva, just 300 kilometers awav.

Strong waved at the prisoners. "Three locals,

sir. I was hoping to-

Martinez leaned forward. "Why, I think I've seen you before," He spoke to the MSP officer, "The ads Michigan State Police uses: our intelligence people have shown me some. You protect MSP's client mobs from outside gangs."

Brierson nodded, smiled wryly. Strong recognized him now and kicked himself for not noticing earlier. If those ads were correct, then Brierson

was one of the top men in the MSP.

"They make you out to be some sort of superman. Do you honestly think your people can stop a modern, disciplined army?

"Sooner or later, Mr. Martinez, Sooner or later," The President smiled, but Strong wasn't sure whether he was piqued or truly amused. "Our armor is approaching Manhattan on schedule, sir. As you know, we regard this action as something of a bench mark. Manhattan is almost as big as Topeka, and has a substantial cottage electronics industry. It's about the closest thing to a city you'll

find in the ungoverned lands." Strong motioned for the guard to remove the three prisoners, but the President held up his hand.

"Let 'em stay, Ed. The MSP man should see this firsthand. These people may be lawless, but I can't believe they are crazy. The sooner they realize that we have overwhelming force—and that we use it

fairly-the sooner they'll accept the situation. "Yes, sir." Strong signaled his analysts, and displays came to life on the situation board. Simultaneously, the conference table was overhung with a holographic relief map of central Kansas. The northerners looked at the map and Strong almost smiled. They obviously had no idea of the size of the New Mexican operation. For months the Republic had been building reserves along the Arkansas. It couldn't be entirely disguised; these three had known something about the forces. But until the whole military machine was in motion, its true size had escaped them. Strong was honest with himself. It was not New Mexican cleverness that had outwitted northern electronics. The plan could never have worked without advanced counter-

Computer-selected radio traffic became a background noise. He had rehearsed all this with the technicians earlier; there was not a single aspect of the operation that the President would miss. He pointed at the map. "Colonel Alvarez has one armored force coming north from Old?0. It should enter Manhattan from the east. The other force left here a few minutes ago, and is approaching town along this secondary road." Tiny silver lights crept along the map where he pointed. A few centimeters above the display, other lights represented helicopter and fixed-wing cover. These coasted

measures equipment-some of it bought from the

northerners themselves.

gracefully back and forth, occasionally swooping close to the surface.

A voice spoke against a background of turbine noise, to announce no resistance along the eastern salient. "Haven't really seen anyone. People are staying indoors, or else bobbled up before we came in range. We're avoiding houses and farm buildings, sticking to open fields and roads."

Strong expanded one of the views from the western salient. The situation board showed a picture taken from the air: A dozen tanks moved along a dirt road, trails of dust rising behind them. The camera chopper must have been carrying a mike. for the rumbling and clanking of treads replaced the radio traffic for a moment. Those tanks were the pride of New Mexico, Unlike the aircraft, their hulls and engines were 100 percent Product of the Republic. New Mexico was poor in most resources, but like Japan in the 20th century, and Great Britain before that, she was great in people and ingenuity. Someday soon, she would be great in electronics. For now, though, all the best reconnaissance and communication gear came from Tinkers, many in the ungoverned lands. That was an Achilles' heel, long recognized by Strong and others. It was the reason for using equipment from different manufacturers all over the world, and for settling for second-class gear in some of the most critical applications. How could they know, for certain, that the equipment they bought was not booby-trapped or bugged? There was historical precedent: The outcome of the Bobble War had been due in large part to Tinker meddling with the old Peace Authority's reconnaissance system.

Strong recognized the stretch of road they were coming up on: A few hundred meters beyond the

lead tank lay an irregular blackened area and the twisted metal that had once been a helicopter.

A puff of smoke appeared by the lead tank, followed by the faint crack of an explosion. Bill Alvarez's voice came on an instant after that. "Under fire. Light mortare." The tank was moving again, but in a large circle, toward the ditch. Guns and sensors on the other armor swung north. "The enemy was lucky, or that was a smart round. We've got radar backtrack. The round came from beyond the other side of the farm we're passing. Looks like a tunnel entrance to the old Fort Riley—Wait, we got enemy radio traffic just before it happened."

His voice was replaced by the crackling of high amplification. The new voice was female, but barely understandable. "General van Steen to forces funintelligible.). You may fire when ready." There

was a screaking sound and other voices.

Strong saw Swensen's jaw sag in surprise, or horror, "General van Steen?"

Colonel Alvarez's voice came back. "There were replies from several points farther north. The original launch site has fired two more rounds." As he spoke, black smoke appeared near the treads of two more tanks. Neither was destroyed, but nei-

ther could continue.

"Mr. President, Mr. Strong, all rounds are coming from the same location. These are barely more than fireworks—except that they're smart. I'll waager 'General van Steen' is some local gangster putting up a brave front. We'll see in a minute." On the holomap, two blips drew away from the other support aircraft and began a low level dash across the miniature Kansas landscape.

The President nodded, but addressed another

unseen observer. "General Crick?"

"I concur, sir." Crick's voice was as loud and

clear as Alvarez's, though the general was 50 kilometers to the east, at the head of the column en route to Topeka. "But we've seen an armored vehicle in the intermediate farmland, haven't we, Bill?" "Yes." said Alvarez. "It's been there for months.

Looks like a hulk. We'll take it out, too.

Strong noticed the northerners tense. Swensen

seemed on the verge of screaming something. What do they know?

The attack planes, twin engine green-and-gray jobs, were on the main view now. They were only 20 or 30 meters up, well below the camera viewpoint, and probably not visible from the enemy launch site. The lead craft angled slightly to the east, and spewed rockets at an unmoving silhouette that was almost hidden by the hills and the corn. A second later, the target disappeared in a

satisfying geyser of flame and dirt.

And a second after that, hell on earth erupted from the peaceful fields: beams of pale light flashed from unseen projectors, and the assult aircraft became falling, swelling balls of fire. As automatic fire control brought the tanks' guns to bear on the source of the destruction, rocket and laser fire came from other locations immediately north of the roadway. Four of the tanks exploded immediately, and most of the rest were on fire. Tiny figures struggled from their machines, and ran from the flames.

North of the farm, Strong thought he saw explosions at the source of the original mortar attack.

Something was firing in that direction too!

Then the camera chopper took a hit, and the picture swung round and round, descending into the fire storm that stretched along the roadway. The view went dark. Strong's carefully planned presentation was rapidly degenerating into chaos. Alvarez was shouting over other voices, demanding the reserves that still hung along Old70 directly south of Manhattan, and he could hear Crick working to divert portions of his air cover to the fight that was developing.

It wasn't till much later that Strong made sense of the conversation that passed between the north-

erners just then:

"Kiki, how could you!" Swensen slumped over the holomap, shaking his head in despair (shame?). Brierson eyed the displays with no visible emo-

tion. "What she did is certainly legal, Al."
"Sure it is. And immoral as hell. Poor Jake

Schwartz, Poor Jake,"

The view of the battle scene reappeared. The picture was almost the same perspective as before but grainier and faintly wavering—probably from a camera aboard some recon craft far south of the fighting. The holomap flickered as major updates came in. The locals had been thorough and successful. There were no effective New Mexican forces within five kilometers of the original flareup. The force dug in to the farmland was firing rockets southward, taking an increasing toll of the armored reinforcements that were moving north from Old70.

"Crick here, Mr. President." The general's voice was brisk, professional. Any recriminations with Intelligence would come later. "The enemy is localized, but incredibly well dug in. If he's isolated, we might be able to bypass him, but neither Alvarez nor I want something like that left on our flank. We're going to soften him up. then move our ar-

mor right in on top.'

Strong nodded to himself. In any case, they had to take this strong point just to find out what the enemy really had. In the air over the holomap, dozens of lights moved toward the enemy fortress. Some flew free ballistic arcs, while others struck

close to the ground, out of the enemy's direct fire. Across the table, the holo lit the northerners' faces: Swensen's seemingly more pale than before, Brierson's dark and stolid. There was a faint stench of sweat in the air now, barely perceptible against the stronger smells of metal and fresh plastic.

Dann. Those three had been surprised by the ambush, but Strong was sure that they understood what was behind the attack, and whence the next such would come. Given time and Special Service drugs, he could have the answers. He leaned across the table and addressed the MSP officer. "So. You aren't entirely bluff. But unless you have many more such traps, you won't do more than slow us up, and kill a lot of people on both sides."

Swensen was about to answer, then looked at Brierson and was silent. The black seemed to be deliberating just what or how much to say; finally, he shrugged. "I won't lie to you. The attack had

nothing to do with MSP forces."

"Some other gang then?"

"No. You just happened to run into a farmer

who defends his property.'

"Bull." Ed Strong had spent his time in the military in combat along the Colorado. He knew how to read the intelligence displays and manage tactics. But he also knew what it was like to be on the ground where the reality was bullets and shrapnel. He knew what it took to set up a defense like the one they had just seen. "Mr. Brierson, you're telling me one man could afford to buy the sort of equipment we saw and to dig it in so deep that even now we don't have a clear picture of his setup? You're telling me that one man could afford an MHD source for those lasters?

"Sure. That family has probably been working at this for years, spending every free cent on the

project, building the system up little by little. Even so," he sighed. "they should be out of rockets and

juice soon. You could lay off."

The rain of rocket-borne and artillery high explosives was beginning to fall upon the target. Flashes and color sparkled across the screen, more an abstract pattern than a landscape now. There was no human life, no equipment visible. The bombers were standing off and lobbing their cargo in. Until the enemy's defenses were broken, any other course was needless waste. After a couple minutes. the airborne debris obscured all but the largest detonations. Napalm flared within, and the whole cloud glowed beautiful yellow. For a few seconds, the enemy lasers still flashed, spectacular and ineffective in all the dirt. Even after the lasers died, the holomap showed isolated missiles emerging from the target area to hunt for the bombers. Then even those stopped coming.

Still the barrage continued, raising the darkness and light high over the Kansas fields. There was no sound from this display, but the thudthudding of the attack came barely muffled through the hull of the C&C van. They were, after all, less than 7,000 meters from the scene. It was mildly surprising that the enemy had not tried to take them out. Perhaps Brierson was more important, and more Perhaps Brierson was more important, and more

knowledgeable, than he admitted.

Minutes passed, and they all—President and gangsters alike—watched the barrage end and the wind push the haze away from the devastation that modern war can make. North and east, fires spread through the fields. The tanks—and final, physical possession of the disputed territory—were only minutes away.

The destruction was not uniform. New Mexican fire had focused on the projectors and rocket launch-

ers, and there the ground was pulverized, ripped first by proximity-fused high explosives, then by digger bombs and napalm. As they watched, recon craft swooped low over the landscape, their multiscanners searching for any enemy weapons that might be held in reserve. When the tanks and personnel carriers arrived, a more thorough search would be made on foot.

Finally, Strong returned to Brierson's fantastic claim. "And you say it's just coincidence that this one farmer who spends all his money on weapons happens to be on our line of march.

Coincidence and a little help from General van Steen."

President Martinez raised his eyes from the displays at his end. His voice was level, but Strong recognized the tension there. "Mr., uh, Brierson, Just how many of these miniforts are there?"

The other sat back. His words might have seemed insolent, but there was no sarcasm in his voice. "I have no idea. Mr. Martinez. As long as they don't bother our customers, they are of no interest to MSP. Many aren't as well hidden as Schwartz's, but you can't count on that. As long as you stay off their property, most of them won't touch you.

"You're saying that if we detect and avoid them, they are no threat to our plans?"
"Yes."

The main screen showed the tank forces now. They were a few hundred meters from the burning fields. The viewpoint rotated and Strong saw that Crick had not stinted; at least 100 tanks-most of the reserve force-were advancing on a 5.000-meter front. Following were even more personnel carriers. Tactical air support was heavy. Any fire from the ground ahead would be met by immediate destruction. The camera rotated back to show the desolation they were moving into. Strong doubted that anything living, much less anything hostile,

still existed in that moonscape.

The President didn't seem interested in the display. All his attention was on the northerner. "So we can avoid these stationary gunmen till we find it convenient to deal with them. You are a great puzzle, Mr. Brierson. You claim strengths and weaknesses for your people that are equally in-credible. And I get the feeling you don't really expect us to believe you, but that somehow you believe everything you're saying."

"You're very perceptive. I've thought of trying to bluff you. In fact, I did try earlier today. From the looks of your equipment"—he waved his hand at the Command and Control consoles, a faintly mocking smile on his face—"we might even be able to bluff you back where you belong. This once. But when you saw what we had done, you'd be back again-next year, next decade-and we'd have to do it all over again without the bluffs. So, Mr. Martinez, I think it best you learn what you're up against the first time out. People like Schwartz are just the beginning. Even if you can rub out them and services like MSP, you'll end up with a guerrilla war like you've never fought-one that can actually turn your own people against you. You do practice conscription, don't you?"

The President's face hardened, and Strong knew that the northerner had gone too far. "We do, as has every free nation in history-or at least every nation that was determined to stay free. If you're implying that our people would desert under fire or because of propaganda, you are contradicting my personal experience." He turned away, dis-

missing Brierson from his attention.

"They've arrived, sir." As the tanks rolled into

position on the smoking hillsides, the personnel carriers began disgorging infantry. The tiny figures moved quickly, dragging gear toward the open tears in the earth. Strong could hear an occasional popping sound: Misfiring engines? Remnant ammo? Tactical aircraft swept back and forth overhead.

their rockets and guns ready to support the troopers on the ground. The techs' reports trickled in.

"Three video hard points detected," small arms fire chattered. "Two destroyed, one recovered. Sonoprobes show lots of tunnels. Electrical activity at—" The men in the picture looked up, at something out of view.

Nothing else changed on the picture, but the radars saw the intrusion, and the holomap showed the composite analysis: a mote of light rose leisurely out of the map—500 meters, 600. It moved straight up, slowed. The support aircraft swooped down upon it and—

A purple flash, bright yet soundless, seemed to go off *inside* Strong's head. The holomap and the displays winked down to nothing, then came back. The President's image reappeared, but there was no sound, and it was clear he was not receiving. Along the length of the van, clerks and analysts

came out of that stunned moment to work frantically with their equipment. Acrid smoke drifted into the conference area. The safe, crisp displays had been replaced by immediate deadly reality.

had been replaced by immediate, deadly reality.
"High flux nuke." The voice was calm, almost mechanical.

High flux nuke. Radiation bomb. Strong came to his feet, rage and horror burning inside him. Except for bombs in lapsed bobbles, no nuclear weapon had exploded in North America in nearly a century. Even during the bitterest years of the Water Wars, both Aztlân and New Mexico had

seen the suicide implicit in nuclear solutions. But here, in a rich land, without warning and for no real reason-

"You animals!" he spat down upon the seated northerners.

Swensen lunged forward. "God damn it! Schwartz

isn't one of my customers! Then the shock wave hit. Strong was thrown

across the map, his face buried in the glowing terrain. Just as suddenly he was thrown back. The prisoners' guard had been knocked into the far wall: now he stumbled forward through Martinez's unseeing image, his stun gun flying from his hand.

From the moment of the detonation, Brierson had sat hunched, his arms extended under the table, Now he moved, lunging across the table to sweep up the gun between his manacled hands. The muzzle sparkled and Strong's face went numb. He watched in horror as the other twisted and raked the length of the van with stunfire. The men back there had themselves been knocked about. Several were just coming up off their knees. Most didn't know what hit them when they collapsed back to the floor. At the far end of the van, one man had kept his head. One man had been as ready as Brierson.

Bill Alvarez popped up from behind an array processor, a five millimeter slug-gun in his hand,

flashing fire as he moved.

Then the numbness seemed to squeeze in on Strong's mind, and everything went gray.

Wil looked down the dim corridor that ran the length of the command van. No one was moving. though a couple of men were snoring. The officer with the handgun had collapsed, his hands hanging limp, just a few centimeters from his pistol. Blue sky showing through the wall above Wil's head was evidence of the fellow's determination. If the other had been a hair faster . . .

Wil handed the stun gun to Big Al. "Let Jim go down and pick up the slug gun. Give an extra dose

to anyone who looks suspicious."

Al nodded, but there was still a dazed look in his eyes. In the last hour, his world had been turned upside down. How many of his customers-the people who paid for his protection-had been killed? Wil tried not to think about that; indirectly, those same people had been depending on MSP. Almost tripping on his fetters, he stepped over the fallen guard and sat down on the nearest technician's saddle. For all New Mexico being a foreign land, the controls were familiar. It wasn't too surprising. The New Mexicans used a lot of Tinker electronics, though they didn't seem to trust it: much of the equipment's performance was downgraded where they had replaced suspicious components with their own devices. Ah, the price of paranoja.

Brierson picked up a command mike, made a simple request, and watched the answer parade across the console. "Hey, Al, we stopped transmitting right at the detonation!" Brierson quickly entered commands that cleared Martinez's image and blocked any future transmissions. Then he asked for status.

The air conditioning was down, but internal power could keep the gear going for a time. The van's intelligence unit estimated the nuke had been a three kiloton equivalent with a 70 percent radiance. Brierson felt his stomach flip-flop. He knew about nukes—perhaps more than the New Mexicans. There was no legal service that allowed them and it was open season on armadillo who advertage.

tised having them, but every so often MSP got a

case involving such weapons. Everyone within 2,000 meters of that blast would already be dead. Schwartz's private war had wiped out a signifi-

cant part of the invading forces.

The people in the van had received a sizable dose from the Schwartz nuke, though it wouldn't be life-threatening if they got medical treatment soon. In the division command area immediately around the van, the exposure was somewhat higher. How long would it be before those troops came nosing around the silent command vehicle? If he could get a phone call out—

But then there was Fate's personal vendetta against W. W. Brierson: Loud pounding sounded at the forward door. Wil waved Jim and Al to be quiet. Awkwardly, he got off the saddle and moved to look through the old-fashioned viewplate mounted next to the door. In the distance he could see men carrying stretchers from an ambulance; some of the burn cases would be really bad. Five troopers were standing right at the doorway, close enough that he could see blistered skin and burned clothing. But their weapons looked fine, and the wiry noncom pounding on the door was alert and energetic. 'Hey, open up in there!'

Wil thought fast. What was the name of that VIP civilian? Then he shouted back (doing his best to imitate the clipped New Mexican accent), "Sorry, Mr. Strong doesn't want to breach internal atmosphere." Pray they don't see the bullet holes tust

around the corner.

He saw the sergeant turn away from the door. Wil lip-read the word shit. He could almost read the noncom's mind: The men outside had come near to being french-fried, and here some silkshirt supervisor was worried about so-far-nonexistent fallout.

The noncom turned back to the van and shouted. "How about casualties?"

"Outside of rad exposure, just some bloody noses and loose teeth. Main power is down and we can't transmit," Wil replied.

"Yes, sir. Your node has been dropped from the network. We've patched backward to Oklahoma Leader and forward to div mobile. Oklahoma Leader wants to talk to Mr. Strong, Div mobile wants to talk to Colonel Alvarez. How long will it be till you're back on the air?"

How long can I ask for? How long do I need? "Give us fifteen minutes," he shouted, after a

moment.

"Yes, sir, We'll get back to you," Having innocently delivered this threat, the sergeant and his troopers moved off.

Brierson hopped back to the console, "Keep your eves on the sleepers, Al. If I'm lucky, fifteen minutes should be enough time."

"To do what? Call MSP?"

"Something better, Something I should have done this morning." He searched through the command menus for satellite pickups. The New Mexican military was apparently leery of using subscription services, but there should be some facility for it. Ah, there it was, Brierson phased the transmitter for the synchronous satellite the Hainan commune had hung over Brazil, With narrow beam, he might be able to talk through it without the New Mexicans realizing he was transmitting. He tapped in a credit number, then a destination code.

The display showed the call had reached Whidbey Island. Seconds passed. Outside, he could hear choppers moving into the camp. More ambulances?

Damn vou. Rober. Be home.

The conference area filled with bluish haze, then

became a sunlit porch overlooking a wooded bay. Sounds of laughter and splashing came faintly from the water. Old Roberto Richardson never used less than full holo. But the scene was pale, almost ghostly—the best the van's internal power supply could do. A heavyset man with apparent age around 30 came up the steps onto the porch and sat down; it was Richardson. He peered out at them. "Wil? Is that you?"

If it weren't for the stale air and the dimness of the vision, Wil could almost believe he'd been transported halfway across the continent. Richardson lived on an estate that covered the whole of Whidbey Island. In the Pacific time zone it was still morning, and shadows swept across lawn-like spaces that stretched away to his manicured forests. Not for the first time, Wil was reminded of the faerie landscapes of Maxfield Parrish. Roberto Richardson was one of the richest men in the world; he sold a line of products that many people cannot resist. He was rich enough to live in whatever fantasy world he chose.

Brierson turned on the pickup that watched the conference table.

"Dios. It is you, Wil! I thought you were dead or captured."

"Neither, just yet. You're following this ruckus?"
"Por cierto. And most news services are covering it. I wager they're spending more money than your blessed Michigan State Police on this war. Unless that nuke was one of yours? Will, my boy, that was spectacular. You took out twenty percent of

their armor."
"It wasn't one of ours, Rober."

"Ah. Just as well. Midwest Jurisprudence would withdraw service for something like that."

Time was short, but Wil couldn't resist asking,

"What is MSP up to?"

Richardson sighed. "About what I'd expect. They're finally brought some aircraft in. They're buzzing around the tip of Dave Crick's salient. The Springfield Cyborg Club has gone after the New Mexican supply lines. They are causing some damage. A cyborg is a bit hard to kill, and Norcross Security is supplying them with transports and weapons. The New Mexicans have Wachendon suppressors down to battalion level, so there's no bobbling. The fighting looks quite 20th century.

"You've got a lot of public opinion behind you—
even in the Republic, I think—but not much

firepower.

"You know, Wil, you fellows should have bought more from me. You saved a few million, maybe, passing up those aerial torpedoes and assault craft, and the tanks, But look where you are now. If—"

"Jesus, that's Robber Richardson!" It was Big Al; he had been watching the holo with growing

wonder.

Richardson squinted at his display. "I can hardly see anything on this, Wil. Where in perdition are you calling from? And to you, Unseen Sir, it's Roberto Richardson."

Big Al walked toward the sunlit porch. He got within an apparent two meters of Richardson before he banged into the conference table. "You're the sort of scum who's responsible for this! You sold the New Mexicans everything they couldn't build themselves: the high-performance aircraft, the military electronics." Al waved at the cabinets in the darkened van. What he claimed was largely true. Wil had noticed the equipment stenciled with Richardson's logo, "USAF Inc—Sellers of Fine

Weapon Systems for More than Twenty Years":

the New Mexicans hadn't even bothered to paint it out. Roberto had been born a minor Aztlán nobleman. He'd been in just the right place at the time of the Bobble War, and had ended up controlling the huge munition dumps left by the old Peace Authority. That had been the beginning of his fortune. Since then, he had moved into the ungoverned lands, and begun manufacturing much of his own equipment. The heavy industry he had brought to Bellevue was almost on the scale of the 20th century—or of modern New Mexico.

Richardson came half out of his chair and chopped at the air in front of him. "See here. I have to take enough such insults from my niece and her grandchildren. I don't have to take them from a stranger." He stood, tossed his display flat on the chair, and walked to the steps that led

down to his shaded river.

"Wait, Rober!" shouted Brierson. He waved Big Al back to the depths of the van. "I didn't call to pass on insults. You wondered where I'm calling

from. Well, let me tell you-

By the time he finished, the old gunrunner had remented to his seat. He started to laugh. "I should have guessed you'd end up talking right out of the lion's mouth." His laughter halted abruptly. "But you're trapped, aren't you? No last minute Brierson tricks to get out of this one? I'm sorry, Wil, I really am. If there were anything I could do, I would. I don't forget my debts."

Those were the words Wil had been hoping to hear. "There's nothing you can do for me, Rober. Our bluff in this van is good for just a few minutes, but we could all use a little charity just

now.

The other looked nonplussed.

"Look, I'll bet you have plenty of aircraft and

armor going through final checkout at the Bellevue plant. And I know you have ammunition stocks. Between MSP and Justice, Inc. and a few other police services, we have enough war buffs to man them. At least we have enough to make these New Mexicans think twice."

But Richardson was shaking his head. "I'm a charitable man, Wil. If I had such things to loan, MSP could have some for the asking. But you see, we've all been a bit outsmarted here. The New Mexicans—and people I now think are fronting for them—have options on the next four months of my production. You see what I mean? It's one thing to help people I like, and another to break a contract—especially when reliability has always been one of my most important selling points."

Wil nodded. So much for that brilliant idea.

"And it may turn out for the best, Wil." Richardson continued quietly. "I know your loudmouth friend won't believe this, coming from me, but I think the Midwest might now be best off not to fight. We both know the invasion can't stick, not in the long run. It's just a question of how many lives and how much property is going to be destroyed in the meantime, and how much ill feeling is going to be stored up for the future. Those New Mexicans deserve to get nuked and all the rest, but that could steel them for a holy war, like they've been fighting along the Colorado for so long. On the other hand, if you let them come in and take a whack at 'governing'—why, in twenty years, you'll have them converted into happy anarchists."

Wil smiled in spite of himself. Richardson was certainly the prime example of what he was talking about. Wil knew the old autocrat had originally been an agent of Aztlán, sent to prepare the

Northwest for invasion, "Okay, Rober, I'll think about it. Thanks for talking."

Richardson seemed to have guessed Wil's phantom position on his porch. His dark eyes stared intensely into Wil's. "Take care of yourself, Wili." The cool, northern playground wavered for a

second, like a dream of paradise, then vanished, replaced by the hard reality of dark plastic, glimmering displays, and unconscious New Mexicans. What now, Lieutenant? Calling Rober had been his only real idea. He could call MSP, but he had nothing helpful to tell them. He leaned on the console, his hands sliding slickly across his sweating face. Why not just do as Rober suggested? Give up and let the force of history take care of things. No.

First of all, there's no such thing as "the force of history," except as it existed in the determination and imagination of individuals. Government had been a human institution for thousands of years: there was no reason to believe the New Mexicans would fall apart without some application of physical force. Their actions had to be shown to be impractically expensive.

And there was another, more personal reason. Richardson talked as though this invasion were something special, something that transcended commerce and courts and contracts. That was wrong, Except for their power and their self-righteousness, the New Mexicans were no different from some chopper gang marauding MSP customers. And if he and MSP let them take over, it would be just as much a default. As with Rober, reliability was one of MSP's strongest selling points.

So MSP had to keep fighting. The only question

was, what could he and Al and Jim do now?

Wil twisted around to look at the exterior view

mounted by the hatch. It was a typically crass design flaw that the view was independent of the van's computers and couldn't be displayed except at the doorway.

There wasn't much to see. The division HQ was dispersed, and the van itself sat in the bottom of a ravine. The predominant impression was of smoking foliage and yellow limestone. He heard the keening of light turbines. Oh boy. Three overland cars were coming their way. He recognized the sergeant he had talked to a few minutes earlier. If there was anything left to do, he'd better do it now.

He glanced around the van. Strong was a high presidential advisor. Was that worth anything? Wil tried to remember. In Aztlán, with its feudal setup, such a man might be very important. The safety of just a few leaders was the whole purpose of that government. The New Mexicans were different. Their rulers were elected: there were reasonable laws of succession, and people like Strong were probably expendable. Still, there was an idea here: Such a state was something like an enormous corporation, with the citizens as stockholders. The analogy wasn't perfect-no corporation could use the coercion these people practiced on their own. And there were other differences. But still. If the top people in such an enormous organization were threatened, it would be enormously more effective than if, say, the board of directors of MSP were hassled. There were at least 10 police services as powerful as MSP in the ungoverned lands, and many of them subcontracted to smaller firms.

The question, then, was how to get their hands on someone like Hastings Martinez or this General Crick. He punched up an aerial view from somewhere south of the combat area. A train of clouds had spread southeast from the Schwartz farm. Otherwise, the air was faintly hazy. Thunderheads hung at the northern horizon. The sky had that familiar feel to it. Topeka Met Service confirmed the feeling: This was tornado weather.

Brierson grimaced. He had known that all day. And somewhere in the back of his mind, three had been the wild hope that the tornados would pick the right people to land on. Which was absurd: Modern science could kill tornadoes, but no one could direct them. Modern science can kill tornadoes. He swallowed. There was something he could do—if there was time. One call to headquarters was all he needed.

was all he needed.
Outside, there was pounding on the door and shouting. More ominous, he heard a scrabbling noise, and the van swayed slightly on its suspension: someone was climbing onto the roof. Wil ignored the footsteps above him, and asked the satellite link for a connection to MSP. The black and gold Michigan State logo had just appeared when the screen went dead. Wil tapped futilely at emergency codes, then looked at the exterior view again. A hard-faced major was standing next to the van.

Wil turned on the audio and interrupted the other. "We just got sound working here, Major. What's up?"

This stopped the New Mexican, who had been halfway through shouting his message at them. The officer stepped back from the van and continued in more moderate tones. "I was saying there's no fallout problem." Behind him, one of the troopers was quietly barfing into the bushes. There might be no fallout, but unless the major and his men got medical treatment soon, they would be very sick

soldiers. "There's no need for you to stay buttoned up."

"Major, we're just about ready to go back on the air. I don't want to take any chances."

"Who am I speaking to?"

"Ed Strong. Special Advisor to the President."
Wil spoke the words with the same ponderous importance the real Ed Strong might have used.

"Yes, sir. May I speak with Colonel Alvarez?"
"Alvarez?" Now that was a man the major must

know. "Sorry, he got the corner of an equipment cabinet in the head. He hasn't come to yet."

The officer turned and gave the sergeant a sidelong look. The noncom shook his head slightly. "I see." And Wil was afraid that he really did. The major's mouth settled into a thin line. He said something to the noncom, then walked back to the cars.

Wil turned back to the other displays. It was a matter of seconds now. That major was more than suspicious. And without the satellite transmitter. Brierson didn't have a chance of reaching East Lansing or even using the loudmouth channels. The only comm links he had that didn't go through enemy nodes were the local phone bands. He could just reach Topeka Met. They would understand what he was talking about. Even if they wouldn't cooperate, they would surely pass the message back to headquarters. He ran the local directory. A second passed and he was looking at a narrowband black-and-white image. A young, good-looking male sat behind an executive-sized desk. He smiled dazzlingly and said, "Topeka Meteorological Service, Customer Relations, May I help you?"

"I sure hope so. My name's Brierson, Michigan State Police." Wil found the words tumbling out, as if he had been rehearsing this little speech for hours. The idea was simple, but there were some details. When he finished, he noticed the major coming back toward the van. One of his men carried comm gear.

The receptionist at Topeka Met frowned deli-

cately. "Are you one of our customers, sir?"

"No, damn it. Don't you watch the news? You got four hundred tanks coming down Old70 toward Topeka. You're being invaded, man-as in going out of business!"

The young man shrugged in a way that indicated he never bothered with the news. "A gang invading Topeka? Sir, we are a city, not some farm community. In any case, what you want us to do with our tornado killers is clearly improper. It would he\_\_"

"Listen." Wil interrupted, his voice placating, almost frightened. "At least send this message on

to the Michigan State Police. Okav?"

The other smiled the same dazzling, friendly smile that had opened the conversation, "Certainly, sir." And Wil realized he had lost. He was talking to a moron or a low-grade personality simulator; it didn't matter much which. Topeka Met was like a lot of companies-it operated with just enough efficiency to stay in business. Damn the luck.

The voices from the exterior pickup were faint but clear, "-whoever they are, they're transmitting over the local phone bands, sir." It was an enlisted man talking to the New Mexican major. The major nodded and stepped toward the van.

This was it. No time left to think. Wil stabbed blindly at the directory. The Topeka Met Customer Relations "expert" disappeared and the screen began blinking a ring pattern.

"All right, Mr. Strong," the major was shouting again, loudly enough so that he could be heard

through the hull of the van as well as over the pickup. The officer held a communications headset. "The President is on this line, sir. He wishes to speak with you—right now." There was a grim smile on the New Mexican's face.

Wil's fingers flick across the control board: the

van's singers mak across the control board, the van's exterior mike gave a loud squawk and was silent. With one part of his mind, he heard the enlisted man say, "They're still transmitting,

Major.'

And then the ring pattern vanished from the phone display. Last chance. Even an auto answerer might be enough. The screen lit up, and Wil found

himself staring at a 5-year-old girl.

"Trask residence." She looked a little intimidated by Wil's hulking, scowling image. But she spoke clearly, as one who has been coached in the proper response to strangers. Those serious brown eyes reminded Brierson of his own sister. Bounded by what she knew and what she understood, she would try to do what was right.

It took a great effort to relax his face and smile at the girl. "Hello. Do you know how to record my call, Miss?"

She nodded.

"Would you do that and show it to your parents, please?"

"Okay." She reached offscreen. The recording telltale gleamed at the corner of the flat, and Wilbegan talking. Fast.

The major's voice came over the external pickup: "Open it up, Sergeant." There were quick footsteps and something slapped against the hatch.

"Wil!" Big Al grabbed his shoulder. "Get down. Away from the hatch. Those are slug-guns they have out there!"

But Brierson couldn't stop now. He pushed Al

away, waved for him to get down among the fallen New Mexicans.

The explosion was a sharp cracking sound that rocked the van sideways. The phone connection held, and Wil kept talking. Then the door fell, or was pulled outward, and daylight splashed across him.

"Get away from that phone!"

On the display, the little girl seemed to look past Wil. Her eyes widened. She was the last thing W. W. Brierson saw.

There were dreams. In some he could only see. In others, he was blind, yet hearing and smell were present, all mixed together. And some were pure pain, winding up and up while all around him torturers twisted screws and needles to squeeze the last bit of hurt from his shredded flesh. But he also sensed his parents and sister Beth, quiet and near. And sometimes when he could see and the pain was gone, there were flowers—almost a jungle of them—dipping near his eyes, smelling of violin music.

Snow. Smooth, pristine, as far as his eyes could see. Trees glazed in ice that sparkled against cloudless blue sky. Wil raised his hand to rub his eyes and felt faint suprise to see the hand obey, to feel

hand touch face as he willed it.

"Will, Will You're really back!" Someone warm and dark rushed in from the side. Tiny arms laced around his neck. "We knew you'd come back. But it's been so long." His 5-year-old sister snuggled her face against him.

As he lowered his arm to pat her head, a technician came around from behind him. "Wait a minute, honey. Just because his eyes are open doesn't mean he's back. We've gotten that far before."

Then he saw the grin on Wil's face, and his eves widened a bit. "L-Lieutenant Brierson! Can you understand me?" Wil nodded, and the tech glanced over his head-probably at some diagnostic display. Then he smiled, too. "You do understand me! Just a minute, I'm going to get my supervisor. Don't touch anything." He rushed out of the room, his last words more an unbelieving mumbling to himself than anything else: "I was beginning to wonder if we'd ever get past protocol rejection."

Beth Brierson looked up at her brother. "Are

you okay, now, Wili?'

Wil wiggled his toes, and felt them wiggle, He certainly felt okay. He nodded. Beth stepped back from the bed. "I want to go get Mom and Dad."

Wil smiled again. "I'll be right here waiting." Then she was gone, too, Brierson glanced around

the room and recognized the locale of several of his nightmares. But it was an ordinary hospital room, perhaps a little heavy on electronics, and still, he was not alone in it. Alvin Swensen, dressed as offensively as ever, sat in the shadows next to the window. Now he stood up and crossed the room to shake hands. Wil grunted. "My own parents aren't here to

greet me, yet Big Al is."

"Your bad luck. If you'd had the courtesy to come around the first time they tried to bring you back, you would have had your family and half MSP waiting for you. You were a hero.

"Were?"

"Oh, you still are, Wil. But it's been a while, you know." There was a crooked smile on his face.

Brierson looked through the window at the bright winter's day. The land was familiar. He was back in Michigan, probably at Okemos Central Medical. But Beth didn't look much older, "Around six

months, I'd guess."

Big Al nodded. "And, no, I haven't been sitting here every day watching your face for some sign of life. I happened to be in East Lansing today. My Protection Racket still has some insurance claims against your company. MSP paid off all the big items quick, but some of the little things—bullet holes in outbuildings, stuff like that—they re dragging their heels on. Anyway, I thought I'd drop by and see how you're doing."

"Hmm. So you're not saluting the New Mexican

flag down there in Manhattan?

"What? Hell no, we're not!" Then Al seemed to remember who he was talking to "Look, Wil, in a few minutes you're goma have the medical staff in here patting themselves on the back for pulling off another medical miracle, and your family will be right on top of that. And after that, your Colonel Potts will fill you in again on everything that's happened. Do you really want Al Swensen's Three Minute History of the Great Plains War?"

Wil nodded.

"Okay". Big Al moved his chair close to the bed.
"The New Mexicans pulled back from the ungoverned lands less than three days after they grabbed you and me and Jim Turner. The official Republic view was that the Great Plains Action was a victory for the decisive and restrained use of military force. The 'roving gangster bands' of the ungoverned wastes had been punished for their abuse of New Mexican settlers, and one W. W. Brierson, the ringleader of the northern criminals, had been killed."

"I'm dead?" said Wil.

"Dead enough for their purposes." Big Al seemed momentarily uneasy. "I don't know whether I should tell a sick man how much sicker he once was, but you got hit in the back of the head with a five-millimeter exploder. The Newmex didn't hurt me or Jim, so I don't think it was vengeance. But when they blew in the door, there you were, doing something with their command equipment. They were already hurting, and they didn't have any stun guns, I guess."

A five-millimeter exploder. Will knew what they could do. He should be dead. If it hit near the neck, there might be some forebrain tissue left, but the front of his face would have been blown out. He

touched his nose wonderingly.

Al saw the motion. "Don't worry. You're as beautiful as ever. But at the time, you looked very dead—even to their best medics. They popped you into stasis. The three of us spent nearly a month in detention in Oklahoma. When we were 'repatriated,' the people at Okemos Central didn't have any trouble growing back the front of your face. Maybe even the New Mexicans could do that. The problem is, you're missing a big chunk of brain. He patted the back of his head. "That they couldn't grow back. So they replaced it with processing equipment, and tried to interface that with what was left."

Wil experienced a sudden, chilling moment of introspection. He really should be dead. Could this all be in the imagination of some damned prosthesis program?

Al saw his face, and looked stricken. "Honest, Wil, it wasn't that large a piece. Just big enough to

fool those dumbass New Mexicans."

The moment passed and Brierson almost chuckled. If self-awareness were suspect, there could scarcely be certainty of anything. And in fact, it was years before that particular terror resurfaced. "Okay. So the New Mexican incursion was a great success. Now tell me why they really left.

Was it simply the Schwartz bomb?"

"I think that was part of it." Even with the nuke, the casualties had not been high. Only the troops and tankers within three or four thousand meters of the blast were killed—perhaps 2,000 men. This was enormous by the standards Wil was used to, but not by the measure of the Water Wars. Overall, the New Mexicans could claim that it had been an "inxpensive" action.

But the evidence of casual acceptance of nuclear warfare, all the way down to the level of an ordinary farmer, was terrifying to the New Mexican brass. Annexing the Midwest would be like running a grade school where the kids carried slug guns. They probably didn't realize that Schwartz would have been lynched the first time he stepped off his property if his neighbors had realized be-

forehand that he was nuke-armed.

"But I think your little phone call was just as important."

"About using the tornado killers?"

"Yeah. It's one thing to step on a rattlesnake, and another to suddenly realize you're up to your ankles in 'em. I bet the weather services have equipped hundreds of farms with killers—all the way from Okemos to Greeley." And, as Wil had realized on that summer day when last he was truly conscious, a tornado killer is essentially an aerial torpedo. Their use was coordinated by the meteorological companies, which paid individual farmers to house them. During severe weather alerts, coordinating processors at a met service headquarters monitored remote sensors, and launched killers from appropriate points in the countryside. Normally, they would be airborne for

minutes, but they could loiter for hours. When remote sensing found a twister, the killers came in at the top of the funnel, generated a 50-meter bobble, and destabilized the vortex.

Take that loiter capability, make trivial changes in the flight software, and you have a weapon capable of flying hundreds of kilometers and delivering a one tonne payload with pinpoint accuracy. "Even without nukes they're pretty fearsome. Especially if used like you suggested."

Wil shrugged. Actually, the target he had suggested was the usual one when dealing with marauding gangs. Only the scale was different.

"You know the Trasks-that family you called right at the end? Bill Trask's brother rents space for three killers to Topeka Met. They stole one of them and did just like you said. The news services had spotted Martinez's location; the Trasks flew the killer right into the roof of the mansion he and his staff were using down in Oklahoma. We got satellite pics of what happened. Those New Mexican big shots came storming out of there like ants in a meth fire." Even now, months later, the memory made Big Al laugh. "Bill Trask told me he painted something like 'Hey, hey Hastings, the next one is for real!' on the fuselage. I bet even yet, their top people are living under concrete, wondering whether to keep their bobble suppressors up or down.

"But they got the message. Inside of twelve hours, their troops were moving back south and they were starting to talk about their statesmanship and the lesson they had taught us."

Wil started to laugh, too. The room shimmered colorfully in time with his laughter. It was not painful, but it was disconcerting enough to make

him stop. "Good. So we didn't need those bums from Topeka Met."

"Right. Fact is, they had me arrest the Trasks for theft. But when they finally got their corporate head out of the dirt, they dropped charges and tried to pretend it had been their idea all along. Now they're modifying their killers and selling the emergency control rights."

Far away (he remembered the long hallways at Okemos Central), he heard voices. And none familiar, Damn. The medics were going to get to him before his family. Big Al heard the commotion, too. He stuck his head out the door, then said to Wil. "Well, Lieutenant, this is where I desert. You know the short version, anyway." He walked across the room to pick up his data set.

Wil followed him with his eyes. "So it all ended for the best, except-" Except for all those poor New Mexican souls caught under a light brighter than any Kansas sun, except for-"Kiki and Schwartz. I wish they could know how things turned out."

Big Al stopped halfway to the door, a surprised look on his face, "Kiki and Jake? One is too smart to die and the other is too mean! She knew Jake would thump her for bringing the New Mexicans across his land. She and my boys were way underground long before he wiped off. And Jake was dug in even deener.

"Hell, Wil, they're even bigger celebrities than you are! Old Jake has become the Midwest's pop armadillo. None of us ever guessed, least of all him: he enjoys being a public person. He and Kiki have buried the hatchet. Now they're talking about a worldwide club for armadillos. They figure if one can stop an entire nation state, what can a bunch of them do? You know: 'Make the world safe for the ungoverned."

Then he was gone. Wil had just a moment to chew on the problems van Steen and Schwartz would cause the Michigan State Police before the triumphant med techs crowded into his room.

## EDITOR'S INTRODUCTION TO: THE ULTIMATE WHODUNIT

## by Charles R. Pellegrino

What killed the dinosaurs? There have been dozens of theories. Then, a few years ago, at an annual meeting of the American Association for the Advancement of Science held in San Francisco, Berkeley Nobel laureate Luis Alvarez and his geologist son Walter announced their own. A large asteroid struck the Earth. The resulting steam and dust storms turned off the lights world wide, so that the dinosaurs starved.

At about that time Lucifer's Hammer, by Larry Niven and Jerry Pournelle, was on the best-seller list. Hammer is a story about a comet striking the Earth; naturally, we were pleased to learn that something like Lucifer's Hammer might have been

very real.

Then, last spring, two independent studies looked at periodic extinctions, and postulated that not only did an asteroid strike kill off the dinosaurs, but an earlier strike was responsible for another massive die-off 26 million years before that. In fact, the studies said, the Sun has a dark companion which periodically approaches; and when it does, it brings a mass of asteroids and comets to bombard the planets. In Lucifer's Hammer, Niven and I had postulated a "dark planet" about the size of Jupiter which did precisely that; and one of the groups studying the possibility even called to ask what we had named the Sun's colder brother.

Alas, we hadn't given it a name, so there went our chance.

Not everyone accepts the Alvarez "hammer" explanation. One argument for the asteroid strike is a layer of iridium found across the whole of the Earth; another is Iceland, which may have welled out of the Earth as the result of the big asteroid strike. However, none of this is conclusive.

Charles Pellegrino has another view of the matter. Dr. Pellegrino is an evolutionary biologist with the University of Victoria in New Zealand, making him the farthest-away contributor Far Frontiers has yet had. Pellegrino's book, Darwin's Universe, was a Book of the Month Club selection. Chariot of Apollo: The Making of the Lunar Module will be published by Atheneum in spring of 1985.

## THE ULTIMATE WHODUNIT

Charles R. Pellegrino

If not for bad luck, orangutans—or something very much like them—might now be the wisest of creation's achievements.

It came out of the west-more than 5 million tons of rock and ice-traveling at 32 kilometers (20 miles) a second, and carrying with it a potential explosive force equivalent to more than 100 times its weight in nitroglycerine. It detonated on the forested countryside near Stuttgart, punching out a saucer-shaped depression known today as Germany's Reis Basin, from which sprang running sparks, tight swarms of molten glass, and a roiling black hell made heavy with hot, ground-seeking ash. A gigantic cloud spread out of southern Germany, behaving much like the silt-laden water that creeps along the bottom of a pond after a stone has been hefted in; but this wave front was tens of millions of times more powerful-and fast. It struck along France, Austria, and Czechoslovakia, running like a tidal wave over the land, slashing down trees, and leaving behind a trail of devastation that would put Mount St. Helens to shame. Far above, cubic kilometers of ultra-fine powder entered the stratosphere and began to form a global dust cloud. The sky's transparency changed. In the years to come, sunlight striking the high-altitude particles would radiate some of its energy far from the ground, triggering climatic effects that would span into centuries, and probably amplifying a worldwide cooling that seems (very curiously) to

have already been under way.

This happened about 15 millions years ago, give or take 200,000 years, and it happened during bad biological times. Continent-sized ice sheets were marching across Antarctica, marking a geologically rapid transition from Early to Middle Miocene time, and from a world characterized by limited polar glaciation to a climate more like today's. In the waters near Christchurch, New Zealand, the lush subtropical assemblage of Early Miocene plankton was replaced abruptly by a less diversified, cold-water fauna. New Zealand's giant crab. Tumidocarcinus, suffered near-extinction, branched from diminished numbers into new forms, and then vanished. In more northerly reaches, the tropical forests that girdled the planet receded like a mighty tide toward the equator. As the trees withdrew, Miocene apes found themselves restricted to steadily shrinking habitats. Most of them, including the then-dominant lineage leading to the orangutans, went into eclipse or extinction, and cleared the path for a more obscure lineage-creatures that became us-to tread upon the Earth and, for better or for worse, to take possession of it.

Think upon this: We may owe our existence to nothing more glamorous than luck, to bad weather made worse by the same celestial trapshoot that has pitted every square meter of the moon.

And it happened before, near 34.4 million B.C., at the boundary between Early and Middle Oligocene time. Again, the climate had deteriorated, and again, certain plants and animals performed almost simultaneous disappearing acts. At the same time (as reported in the 21 May 1982 issue of Science), tiny beads of molten glass, called microtectites, carpeted the sea floor around Cuba and the Dominican Republic. The tectites are, with very little doubt, the signature of a giant meteorite that struck the Earth. What is important about this particular layer of tectites is that unusually high concentrations of iridium and other platinumgroup elements are found a few centimeters below them, in a slightly older layer of sediment that is also enriched with microtectites. Curiously, the tectites in the lower layer are black, whereas those in the upper layer are clear and, most important of all, the iridium anomaly grades both above and below the black tectites without touching the clear ones.

The significance of iridium is its scarcity in rocks of the Earth's crust, and its abundance in cosmic dust and stony meteorites. The iridium, taken to gether with the tectites and the extinction, is believed to indicate an asteroid impact. And here the real mystery begins, because there are two layers of tectites in the Caribbean, and one layer of iridium-enriched sediment that does not match either of them exactly. If an asteroid were responsible, we would expect to find all the tectites and all the iridium in one fine layer, with all the tectites the same color, or the black ones at least mixed in with the clear ones. The hypotheses now emerging to explain why we do not see what we ought to see

include displacements of sediment so extraordinary as to be far less believable than the idea that asteroids can cause mass extinctions. In other words, we have doubled the size of the original problem.

I think it is time to start seeking new explanations. I would like to suggest that we are looking at two asteroid impacts near the Caribbean, each producing tectites of a different color, each occurring centuries apart; and I submit that these twin catastrophes were merely symptoms of a greater catastrophe, a subject to which we shall return after looking at the most famous of all disappearing acts—the dinosaurs.

A great deal of mythology surrounds the dinosaur extinction. Just for a start, dinosaurs were not, as a rule, big. Most were barely larger than today's bulls, many were smaller than you and I. and some were smaller than house cats. Though at least one flying saurian grew as big as a jet fighter, many were as small as sparrows, and none of the (known) dinosaurs could match today's blue whales for size. They ranged in size almost as much as the mammals that have replaced them, vet speculations about how to kill dinosaurs continue to focus on their large size, my all-time favorite being the one linking large size to sexual problems, although one is tempted to ask how the last generation of brontosaurs got to be there in the first place if they, and presumably their parents and their grandparents, were unable to copulate without breaking each other's legs. Lately, dinosaur diarrhea has become all the rage. The story goes that dinosaurs had poor taste buds and were thus unable to detect the bitter, poisonous alkaloids in new species of flowering plants. The last generation is then said to have gone rasping and hissing and farting

into oblivion. Of course, this does not explain how flesh-eating and seagoing dinosaurs died eating those same plants, but the theory has been put forth as a good explanation of how the insects and mammals pulled through-which is also a myth. My census of insects in amber shows that, by the time of the great extinction, about 65 million years ago, many modern insects did not yet exist. Only half of the fossil insects belong to known families, and none to known genera or species. In contrast, practically all insects found in 40 million-year-old amber belong to today's families-about half belong to modern genera, and a few even appear to be present-living species. The change occurring in insects between 65 million and 40 million years ago far exceeds the change observed from 40 million years ago to the present. Evidently, not even the insects were able to pass with impunity through the dinosaur crisis.

Enter another layer of iridium-rich sedimentthe first one ever identified, and perhaps the most controversial, for it is found close to the time of the last dinosaurs. But "close" is not good enough. for most of the dinosaurs were already extinct by the time this particular iridium anomaly entered the fossil record. The anomaly was discovered in 1980 by a Berkeley team headed by Nobel Laureate Luis Alvarez and his geologist son, Walter. From Spain to New Zealand, they found a tiny layer of sediment with 20 times more iridium than would normally be found in dirt or stone. (As is often the route to exotic discovery, they were looking for something else.) Part of the insight into what all that extra iridium meant came from the pages of a science fiction novel, leading the Alvarez group to conclude that the iridium arrived, all in one day, aboard an asteroid. But from the beginning, the idea suffered from too much of a good thing. There was a worldwide layer of iridium, 20 times above normal background levels, everywhere you looked. The layer was made more puzzling by concentrations that rose 30 times above normal in Italy, 160 times in Denmark, and more than 200 times in Spain, where the iridium is strewn with 0.5mm (1/50th in.) diameter spheres of rock that appear to have been melted by something possessing all the power of a full-scale nuclear war. The spheres are heavy, and must have fallen to the ground within a few hundred kilometers of where they formed. While all of these things were being unearthed. I was, by happy coincidence, poring over evidence for giant-impact scars on our planet. and eliminating such possibilities as the Hudson Bay. But one candidate refused to go away: an 80 kilometer-wide (50 mile) depression in the North Sea, possibly a fossil asteroid crater re-exposed by glacial action about 6000 years ago. And into this picture came the Alvarez date-iridium concentrations that, if the most likely air and ocean currents were traced to their sources, pointed like a finger to the North Sea

I sometimes have a weakness for jumping to conclusions, and in September 1980 I jumped to one that, at best, provided only a partial answer and, at worst, was totally misleading: All the iridium came from the Devil's Hole in the North Sea. Luis Alvarez liked the idea of an impact on water. This way, most of the iridium would be lofted round the world on mountain ranges of steam, and when it fell to the ground as rain, the water would not show up in the iridium-rich sediment, and hence the seemingly excessive concentrations.

But still, there was too much iridium out there.

My own numbers indicated that, to account for all

of it, the asteroid would have been bigger than the crater I was suggesting it had made. In his letter of October 7, 1980, Harvard paleobiologist Stephen Jay Gould agreed, but added:

"I care rather little for the specifics of the Alvarezes' scenario... what excites me about the Alvarezes' work is not the asteroidal scenario, but the fact that, in their iridium anomalies, they have provided the first plausible type of evidence implicating some kind of extraterrestrial event in major extinctions—a position that has long been reasonable in theory, but could not be exploited because we didn't even know what kind of evidence to look for."

The Alvarez group showed us what to look for. But what does the evidence say? Too much iridium, that's what.

This is as good a place as any to say a few words about how scientists do science. We send ideas out into the world (usually imperfect ones), somewhat like matches tossed into the woods, hoping that one will catch. The Alvarez group, with its iridium anomalies, has started one of this decade's most significant and enduring forest fires and, in the process, drawn a great deal of criticism. But criticism in the sciences does not mean the same thing as criticism in the everyday workplace. A good scientist seeks criticism of his (or her) work, in the form of constructive advice ("Hey guy, I reckon you ought to look at this ... or this ... or that ... and see if such-and-such isn't true"). Science, at its best, operates like a contact sport, with ideas bouncing from mind to mind and sometimes getting connected to each other in startling fashion. The British are especially good at spicing up the

process with morning and afternoon and any-timeyou-please teas. From these relaxed settings emerge some people's best ideas. We've begun to catch on in America, where the president of one engineering firm recently specified that his newest office block should have wide hallways, because that's where the most important meetings take place. The common goal of all these bouncing ideas is a search for the truth, which is why criticism should never be personal, or be taken personally (but scientists are, after all, human beings, and I've seen at least one meeting go from criticism to namecalling to food throwing, and then deteriorate from that point.)

So, with admiration, I have continued to criticize the Alvarez group's excessive iridium concentrations, with the result that in February 1983 I began to wonder what the geological record would look like if we passed the solar system through a dust cloud. As you read this, iridium-rich dust is falling on the Earth at a rate of about 100,000 kilograms (200,000 lbs.) per day. According to 65 million-year-old rock samples from New Zealand. the rate must have been about 2 million kilograms per day when the asteroid hit-20 times higher than normal-which would not be unreasonable in a nebula. If we imagine the in-fall of dust from a nebula as covering the whole Earth in a layer of iridium 20 times richer than normal, we then remove the problem of "too much of a good thing." The solar system's passage through an average garden variety nebula would take about 100,000 years, a mere instant in the terms that rocks and continental plates measure time. And not all of the particles within the nebula are going to be dustsized. They should range up to pebbles, boulders, and even a few flying mountains. On top of this global, 20-fold iridium increase, we would probably find at least one localized spike, which is ex-

actly what we see in Europe.

A nebula would also explain the 34.4 millionyear-old iridium spike in the Caribbean, which does not exactly match two layers of tectites from what would appear to be two separate asteroid inpacts. The implication here is that the probabiity of asteroid and/or comet impacts on Earth must go up with our passage through dust clouds. And the phenomenon should not be limited to the Earth alone. The 34.4 and 65.0-million-year B.C. iridium spikes might also be recorded in layers of lunar soil, which is why I now suggest that a millimeterby-millimeter search for iridium anomalies in the Apollo core samples should soon be undertaken.

I said earlier that asteroid impacts might merely be symptoms of a larger catastrophe. That catastrophe would have been the dust cloud itself. The spiral arms of the galaxy are curdled with stellar nurseries-lanes of density-packed gas and dust. We are in one of those lanes now-fortunately, a relatively dust-free part of it. But, in terms of geological time, we should pass through a nebula almost any day now. When this happens, dust will transform the night sky. Mars, Jupiter, Saturn, and Uranus will grow successively dimmer through the intervening debris and, beyond them, nothing but the faint glow of back-scattered sunlight and excited electrons-no stars in the sky-and the Earth's shadow up there in the night, a backdrop for the meteors. Lots of meteors.

Sunward, our days will be made undetectably darker. As it travels on, the sun will burn a hole through the cloud. Gases will stream instantly away, like the tails of comets, but pebbles are not so easily moved by the solar wind, and because

sunlight gives off energy whenever it strikes matter, as much as 5 percent of the sun's heat might be scattered and absorbed between the orbits of Earth and Venus. And the Earth will grow cold.

This will happen, as almost undoubtedly it has happened. NASA's Michael Rampino and Richard Stothers estimate that the solar system passes through dust lanes about every 33 million years (give or take 3 million years). The 34.4 and 65 million B.C. iridium spikes fall within Rampino and Stothers' estimation and—right you are—the 15 million B.C. Reis Basin impact does not. Well, I never said all asteroids had to come from dust clouds.

Now, here's where the fun begins. University of Chicago paleobiologists Jack Seposki and David Raup have just completed the world's most exhaustive census of extinct animals, from which an astonishing cycle has emerged. Every 26 million years during the last 225 million years (with two apparent exceptions), mass extinctions have occurred clear across the phyletic spectrum, running in parallel over land and sea. Some nonrandom event has been periodically shifting the biological system.

Could it be our passage through dust lanes?

I don't think so. Though the 65 million B.C. extinction, which is associated with an iridium spike, is one of the 26 million year cycle's most prominent examples, the next extinction on the cycle missed the 34.4 million B.C. iridium spike by almost 6 million years. Notably, the 15 million B.C. extinction does fall within the 26 million year cycle, and it does have an asteroid impact associated with it (iridium data are not yet available), but none of the other major extinctions within the cycle, except the one that took out the dinosaurs.

has been found to contain an asteroid or an iridium spike. This is not to say that such spikes do not exist and will not eventually be found. After all, the search has only been on for three years, and we've a few million metric tons of sediment to sift through.

Nevertheless, if we look a little closer at the 65 million B.C. iridium spike, and bear in mind that our passage through a nebula (the probability of such an event goes up in a dust lane) takes about 100,000 years, we see immediately that this cannot account for a gradual but profound retreat of the seas from the continental shelves and deterioration of the Earth's climate during the 5 to 7 million years that preceded the spike. These two phenomena correspond with almost all mass extinctions, and neither dust lanes nor asteroids can explain them. Nor can falling sea level be accounted for by tying water up in growing ice sheets, for with the exceptions of the Triassic/Jurassic (200 million B.C.) and Early-Middle Miocene (15 million B.C.) events, there are no glacial signatures in the 26 million year cycle. And so, the mystery deepens: if not to ice, then where did all the water go?

Oh, if only Agatha Christie had been a paleontologist. She missed out on the world's most exotic

whodunit.

I submit to the jury that the murderer—or at least one of the murderers—is in this room: The Earth

did it.

At this very moment, huge convective currents are bringing laws and hot rocks up to the Mid-Atlantic Ridge, actively producing new sea floor and pushing London and New York apart at a velocity of several centimeters per year. The crust has swollen there and in a dozen other rifts that

crisscross the ocean basins, cracking like chapped lips smiling, and permitting sea water to seep down and return with stolen heat. Some kind of cycle could be at work, though we do not yet know its exact timing. While the Earth's crust is active and swollen, the oceans are pushed up and water spills onto the continental shelves. Then, over millions of years, as heat is radiated into the water, volcanic activity and crustal swelling might subside, whereupon sea level falls, exposing larger continental boundaries, strangling major oceanic currents and trade winds, and causing a complex series of climatic changes that would put the global upheavals of 1982–1983 to shame.

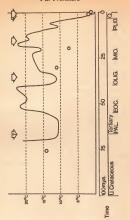
We know from the 344 million B.C. iridium anomaly that asteroids and dust alone might be capable of triggering at least small-scale extinctions. We know that retreating seas can also herald mass dyings. We know that an iridium anomaly was superimposed on top of retreating seas 65 million years ago. We also know of cycles in the Earth's rotation axis that determine how much solar energy our planet can capture, and there are hints that the sun's energy output fluctuates in a cyclic manner, and that this cycle, too, might have plaved a part in ending the days of the dinosaurs.

It begins to look as if there was a lot of bad luck floating around at the end of the Cretaceous Period.

That's what killed the dinosaurs.

Bad luck.

A fascinating puzzle emerges when reliably dated asteriod impacts farrowsy are plotted alongside the palcetimeprature record for the last 75 million years. Impacts (documented by iridium anomalies and/or radiometrically dated (impact glass) appears to be associated with climate they may only appear so, because they occur after the fact. It is possible that the probability of impact glass formation or widespread iridium dispersal increases as the probability of an incoming asteroid striking most likely to be recorded when sea level falls and large portions of the Earth's surface are exposed. In other words, the impact 'cycle' 'may be merely an artifact of climatic trends that, among other things, trigger mass dyings (malter than the impacts being a prime cause of the dyings). events, major crites in the history of file coincide more closely with the



climatic deterioration that often precedes the impacts. Cyclic flutuations of the solar constant and/or the rate of mid-ocean pyreading may be at the root of the critical electrication. Arrows at the top, of the chart (approximately 65 million B.C.) an Early-Middle Oligomer iridium anomaly and impact glass (344 million B.C.) and Early-Middle Oligomer iridium anomaly and impact glass (344 million B.C.) are flut greater than 100 million B.C.) and the state of the state of the control of the control

#### ADDITIONAL READING

Readers interested in further explanations of the topics covered in this chapter may find the following publications helpful. The references listed here also contain references, and are thus a good lead into the current literature.

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### EDITOR'S INTRODUCTION TO: MORNING ON VENUS

by Rivka Jacobs

We all long for final solutions; the one supreme effort that will solve all problems, after which we can rest. Alas, it is not to be. We may create a Novum Ordum Seclorum; but it must be preserved. As Benjamin Franklin said, the Convention

gave us a Republic-if we can keep it.

There are worlds upon worlds, futures upon futures. Some we fly to, some we must avoid. Rivks Jacobs, a new writer who has much to say, has the ability to create worlds and futures that feel lived in. Here she tells us of a future that might arise even though this generation goes to space and creates its new order. Tyrany comes in many flavors; some might prove as addictive as any other heady narcotic.

# MORNING ON VENUS

#### Rivka Jacobs

Josef Emil Chazak, born in Budapest, had been a pink and round summer baby in 2290, coming into a warm, hopeful world. Now, 60 years later, still in the ancient city of Budapest, he was tall and thin, with a Prussian posture and a paunch of slack muscles. His gray hair revealed slashes of black, remainders of youth. He presented to the public dark eyes, a pale complexion, straight whitened brows, a Roman nose, a narrow mouth braced by slanting lines that suggested fortitude, sharp cheeks crosshatched by nascent wrinkles, and a clean chin.

Chazak left his villa at eleven o'clock, after anotter attempt to continue his latest book. The political malaise caused by Prime Minister Komensky's unabated organic fever oppressed his Earth, and Chazak, who considered himself a living antenna, had perhaps been touched by the collective tension. For whatever reason, on this day he found

it impossible to work.

By habit, when mental barriers arose, Chazak walked to clear his mind. There was a particular route he always followed. He lived near Varhegy, close to Atilla Way, and proceeded from there along the complex of weblike pedways through Buda, across the Danube River, to Pest. Above and around him were cloud-studded swatches of blue sky, the high silver spires, spans, and curves of the city's architecture framed by the regular spans of the ped's plastiglass walls and awning. His boots clicked briskly on the enclosed cement.

He 'returned to Buda via the Erzsébet Bridge, strode west down Hegyalja Way. Private vehicles, public transport whizzed by both below and beside him: elevated trains passed whispering on their magnetic cushions; screeching defined the ebb and flow of wheeled cars. Air-pontooned coaches darted, leaving sighs behind. Shade and glaring stabs of sunlight flickered through the sparkling sections of awning; high-altitude craft could be glimpsed gleaming against the deeper blue of the midheaven, drifting in holding patterns over a major polis of the Republic.

Chazak neared the cemetery.

The cemetery was at least 500 years old. It was a secluded monument that had survived alternating wars and building sprees. It was born of war. Chazak the historian understood the dates 1848, 1914, 1940, 1956, that labeled the mildewed, flat, sometimes nameless markers. Larger monoliths, once-great statuses now corroded and broken, temples of ashes were scattered amid the rows of uniform stone crosses and blocks. There were also trees, flowering shrubs, and benches. Chazak typic

cally rested here for 30 minutes before completing the circuit north, to his home.

He slowed and exited smartly, descended at his own speed over the escalator's steps moving in perpetuum. At the cemetery entrance he marched by evergreen jambs, and quickly left the sweetsmelling hedge behind as a buffer between himself and the outside world.

He casually noted a woman, apparently an alien or hybrid outworlder. By the simplicity of the stranger's outfit, he guessed that she was an experienced traveler. She was standing before the ruins of a colossal group of marble heroes: St. Stephen, John Hunyady, Francis II Rákóczy, Louis Kossuth. Chazak unconsciously paused to watch her. There was something delicate yet formidable about her bearing. With feline intuition, the stranger abruptly rotated her head and returned his stare. Her short platinum hair seemed to stiffen like a cat's dorsal fur. The loose, light clothing filled; limbs activated. Chazak as quickly averted his eyes. Feeling unaccustomedly insecure, the historian moved ahead several paces. In reflex, he glanced backward. The figure was gone.

The vision left him motionless.

Within a few seconds he was surprised by his own distraction. He decided to explore his feelings, while he found his favorite bench and sat down slowly. The mysterious or exotic had always rendered him vulnerable, he reflected. Suddenly sharp memories were stirred: of Altair delta. Barhedha, Borsippa-excursions of his youth, alien worlds. How long had it been? he asked himself. He had resettled in Budapest in 2320. Thirty years of Earth.

Was he now tired? Had living the bloated, magnified life taken its toll? Certainly fame no longer stimulated him—an adversary of the great politicos, a man who had long ago found more delight
in the company of his enemies than that of the
common man. "Well, this is true," he said to himself. He was stagnant, losing ground to the cynicism that had sustained his work. Even Komensky's
sickness had failed to move him. The cemetery,
though, this cemetery, as always, had not failed
him. It had taken an active part in the conception
of an idea, that being that he would travel.

A trip would revitalize him. Nothing else could resurrect his spirit. The thought animated him. He began to retrace his way out of the necropolis. A taste of disquiet caused him to pause, to look back for the second time. He saw no other person. Had that alien appartition been his, or was there a corporeal individual wandering another tract of graves out of his line of sight? He chided himself. Imagination had served. He was rational again. He commenced planning the particulars of his prospective journey.

2

Chazak had been a prodigy. He had invested his talents in journalism and history. With the rise of the Eastern European Republic and its capital of Zlata Praha—Golden Prague—he had also been raised. But his was an internal, earthbound task. While others, like Ionian poets of ancient times, added new chapters to the saga of human achievement on distant worlds, while nonhuman, hybrid, and Terran forms were synthesized, he remained at the hub. He was the court recorder, the Nathan to Komensky's King David, the Cicero of Earth's galactic age. All eventually came to Rome; in the

end, he reasoned, his contribution would be the most valuable.

He was eloquent, a branding iron that appealed to the masses. The citizens of the Republic and her territories trusted him. In their eyes he was the aristocrat who spoke for them.

His protagonists were stalwart individualistshonest, almost saintlike archetypes. He honored the Americans, the French and Hungarians of 1848, the first Czechoslovakia of 1918. His idol was Thomas Masaryk. His motto was the Hussite theme that Masaryk adopted, pravda vitězi: truth prevails. Chazak had produced a biography of the first president, a tome which at the same time criticized the present regime.

The first Republic was brought into being by a philosopher, a political economist, and an astronomer. What more apt progenitors?" Chazak had written in the introduction to his second book. 1918 to 1938. "If Štefánik were born again today he would not be in the least astounded. An aviator, scientist, and politician whose tomb has become a mountain shrine, he would be leading expeditions to the most marginal worlds. Benes would be the manager, the diligent guard of his nation's age of splendor. And Thomas Masarvk, if he were to rematerialize in the capital city of a hundred worlds, what would his reaction be?"

The Potential of the Common Man had been Chazak's third success. It was purely political, highly inflammatory, in a so-called republic that had reinstituted the robot system conscripting its own impoverished citizens and selling them to colonial settlements on distant worlds. "Cyber is mechanical, android is artificial, but robot is human slavery-human beings without freedom," he had

stated

Chazak married at 22 years of age, and had been faithful to his wife until she died 18 years later. His two tall and handsome sons were on Caph alpha, or Amarna, the elder a poet, and the younger an Amarnan official.

3

He chose Amarna. This was a practical decision. It was the home of his sons and grandchildren and it was the planet respected by the galaxy's denizens for its uncompromising dedication to aesthetic values. He had never been on an Amarnan run: the world was reached via Warp Route 1 and the planets of Schedir. And, of course, the Amarnans would welcome a man of his accomplishments.

Chazak began putting his plan into action: purchasing passage, reserving accommodations, arranging for the care of his villa, settling business and tax matters. It was the ideal time for a vacation, he reasoned. Komensky's illness had glued the Republic with anxiety, affixing the powerful while they awaited a vacant throne. It would be in keeping with his reputation for Chazak to holiday at this moment.

He contemplated the ingenuity of the galaxy's humanoids. Warp routes had been mapped and studied by adventurers and scientists: he marveled at the breadth of human spirit. His life had been confined to the center of the revolving wheel, the ever changing but never progressing darker side of Homo sapiens.

One week before his scheduled departure his confidence began to evaporate. His sons' affection was wavering; he wasn't young. The trip was expensive; the destination hardly exciting. If he wanted adulation and a surrounding crowd of artists, he could go to Martian Nitra or the capital itself. Prague. When the day for the journey arrived, after his farewells and statement to the press, he was certain the Amarnan escapade was a mistake.

He boarded the shuttle; knew his luggage was in the hold beneath. Soon, the orbiting Class X-III cruiser floated by the shuttle's ample windows as they made their approach, at which point he decided, completely sure of himself once again, that

this was as far as he would go.

There was less of a problem than he anticipated. His return would be via Mars as the shuttle was on a timetable. Alone in the cabin, he relaxed, enjoying the universe. The about-face would be considered a good joke, an attempt to avoid the reporters and parasites seeking his influence. Where should I go? he asked himself. Znajmo or Nitra on Mars were stable, enclosed cities but he lived in much the same environment. He thought of Venus; so close and so far from Earth, the example of yet another technical triumph for mankind, fulfilling his needs yet not exhausting him. Yes, he nodded. "Definitely." he spoke aloud. He would try Venus.

In Martian Nitra he exchanged tickets and received credit for his refund. He changed reservations and arranged for his baggage to be transferred to a Class XII-V cruiser named the *Paris*, much to his amusement. The *Paris* carried approximately

75 passengers.

Chazak was pleased with himself. He came aboard the cruiser for the day-and-a-half trip.

The Paris was not a new ship. The single long cylinder, with bird beak bow and flat, fantail-flanked stern, had been constructed when Chazak was a youth. Its hull was now pitted, gnarled, scarred by repair torches. The port and starboard

ducts emitted unusable fuel waste as the voyage to Venus progressed at a slow, stately pace. Those many years before, Chazak had been inside a sister ship of similar design. He now noted the Paris's interior deterioration. The age of exploration was long over. Corrosion seeped from under joining strips of metal. Forces unpredictable 50 years before ate at the allows, the synthetics, the plastics.

"It seems man can't build anything that mellows or improves with time," Chazak mused. "Not like ancient days, when an object was venerated sim-

ply because it was old."

He smiled politely at fellow travelers who didn't know who he was. Martian tourists comprised the majority. The rest were divided into small charter groups. One noisy band in particular caught his attention. Adolescents from the lunar colonies. Anglish by their language, laughed and gamed amid the disapproving glares of older passengers. Chazak enjoyed their raucousness. One of their number, as they all waited outside the dining room for lunch, seemed more intoxicated than her mates. Her motions were more exaggerated, her flippancy more pronounced. Dangling limply from her waving fingers was a Genran cigarette, the drugging fumes of which had dilated her eyes. Chazak abruptly realized that this was no teenager. Though all the trappings were accurate, he was suddenly positive that this woman was older than he. There was something wavering, unbalanced, distorted about her that gave a lie to the tightly stretched, intoxicated face. He turned away, embarrassed, afraid that the subject of his scrutiny would notice his interest. The luncheon was announced. Chazak let the young people file in before he entered. He involuntarily gazed again on the woman. Her platinum hair was long and teased into full curls, her features thickly painted. An intense feeling of insecurity was rekindled, and Chazak decided to avoid the lunar party altogether for the rest of the trip.

Venus, called Earth's sister with her gravity and diameter so similar, was no longer the shrouded sphere of antiquity, Chazak watched the transfigured world increase through a large inclined transparency above the observation deck. Scratchy Muzak filtered from perforations behind. Other passengers joined him: the approach was billed as part of their tour. He resumed his own sightseeing. Venus rotated from west to east: Chazak recalled that in 11.340 years of history, the priests and Egyptians told Herodotus, the sun as seen from Earth changed position four times-twice rising where it normally set, twice setting where it normally rose. He saw that Venus now was a sickly white planet with some remaining clouds, like shreds of skin. Natural and the predominantly artificial features broke the albinic veneer like bruises. What would he find, he thought, if he tore open a chrysalis too soon, exposing a soft butterfly-worm?

4

The *Paris* was a Praguer ship, so the stops would be Republican or allied settlements and resorts. Chazak was relieved to learn that his city of choice, Kithira, was the first point of departure.

Kithira was on the Venusian arctic circle in the eastern hemisphere. Its closest neighbors were the American Pentarchy's Providence, 50 kilometers to the north, and Prague's Hranice, 60 kilometers to the southeast. Near the pole, Lagan territory squeezed the American-EER holdings, the principal African city being Lakedaemonia, 150 kilos northwest of Kithira.

Chazak greeted the surface from Mount Ida, an immense black mesa that was constructed as the Kithiran terminus. The Paris had floated into its dock and silently, subtly assumed the planet's gravity so that the passengers, eagerly watching the huge spaceport's thousands of gaily colored lights draw closer, were surprised to hear the announcement that they had landed.

Disembarking, Chazak and the others passed into and through a narrow gate where they were all carefully scanned by small beams of light that shot like angry bees from the glassy metal walls. Soon the tight file of people fanned out into the concourse, where most were busy, like Chazak, staring around them in admiration and eager

anticipation.

The entire conglomeration of buildings on Mount Ida, including pedways, concourses, lobbies, waiting platforms, and observation decks, was constructed of an invisible glass alloy plating. This created the feeling that all material objects were suspended over the surface. Chazak approached the wall of the concourse that led to the lobby. He peered through it and surveyed the seemingly unending blacktop of the "mountain" below, studied the distant features of the Paris limned by uncountable small dots of light. He could not yet see the city of Kithira.

In the lobby, he hastily gathered testimonials: the ways to travel, the sites to visit, the restaurants to eat at. He was întrigued now, and thus

impatient.

He exited via the southern door and caught one of the commuter trains that constantly, like sighing lightning, transported people to and from Kithira. They went through a long tunnel of dense. matted vegetation: his compartment's reading lamps brightened in the relative darkness. Then they were out racing over a level landscaped area. Within minutes Chazak, his baggage at his feet, was standing on one shiny metal pier of the Adonis Canal.

He tarried here. Docks identical to his jutted into the water at regular intervals, like square teeth, along both banks of the canel. Chazak watched the bustle of activity to the right and left of him as small air boats and lareer gondolas re-

ceived and discharged fares.

As no ferry was immediately available for his pier. Chazak had time to absorb his new milieu. Kithira was by Terran standards a subtropical city. He turned in place and studied the lush flora behind him: the cabbage palms, blooming vines, slender grasses, the massive trees dripping with moss, the numerous stands of colorful flowers, all retained the dun tints and fulsome odors of a jungle summer twilight, Sapient Mirfaki birds, hybrid parrots, Rigelian prosimians called Nemvetski, their wings shuddering among the lush upper tree branches, and Leilas, their mammalian flight membranes deflating like balloons as landings were safely completed, these brought a whiff of the alien. There were Terran bats, apes, monkeys, and rodents, flapping, chattering, scurrying. The planned environment was familiar and unfamiliar, dangerous without presenting any real threat.

It was dusk. It would be early evening in Kithira for another few Terran days. Sleek silver stalks, each sprouting four beaming globes of light, ambled down the center of piers, along the canal, flanked paths, and surrounded train kiosks. The heavily perfumed air idled. Water gurgled tone-lessly. Chazak stepped gingerly to the edge of the dock and looked down. The confined liquid seemed

unfathomable, mildly ominous without wavelets to refract, without the relief of momentary glitter. He gazed around him. The gondolas' broad-beamed bows gliding and scraping metal against metal, the gondoliers in the narrow sterns trading curses, the shadowy and varied visitors producing a hum of conversation, the mist yquality of Kithira's horizonal city neon wrapped Chazak. He drifted, thankful for his choice. Venus suited him.

Chazak started as he realized a gondolier, a woman whose milky head bobbed just over the top of the pier, was carefully observing him. He fumbled for his luggage and apologized, hoping for service. The other poled the boat closer. With her delicate strong hands splayed on the alloy quay, she deftly vaulted up. "Debuijt, thank you," Chazak muttered sincerely. The other took no notice. She silently dropped Chazak's bags on the fore of two cushioned seats, turned to aid with a talonlike grin Chazak's descent to the aft.

"I'm staying at the Hotel Troy," the historian said, and leaned into the soft back, resting the rear of his skull on the rim. With the gondolier behind him, he once more softened and relaxed. The pole slid silkily amid crystal splashes. The boat rocked, steadied. They tacked and streamed into the cen-

ter of the Adonis.

They passed sibling craft. Chazak tried to picture where the Troy was supposed to be. The steady rhythm of the gondolier's pole propelled him to complacency. Points of light smeared, quavered, sometimes scribbled retinal lines as the water danced. The wharves receded. Colorfully illuminated buoys, masted boats with Omorkan living lanterns strung tepee fashion, began to dominate the vista. Lake Myrrha, he remembered, was the Adonis's reservoir. He sat erect, examining the dis-

tant docks as they passed for a hint concerning his location. He knew the Rostislaw Highway was served by the lake, and his hotel was on the Rostislay. He opened his mouth to ask but thought better of it. The gondola continued a direct course into the widest part of Lake Myrrha. Logically, they should have turned right, toward the streets. Floating blocks of buildings appeared before them. Snatches of ferce laughter and brazen music wafted on a sodden, sluggish breeze. "Promittle, excuse me," he finally ventured in Czech and English, not sure of the gondolier's origin, "perhaps you didn't hear me. I said the Troy."

"The canal doesn't front your hotel." The voice

was low, emotionless.

"I know that. But I expect we've passed the appropriate wharf."

"This is the right way."

Chazak remained emotionally ruffled. He did not like being opposed, especially by one hired to obey. "Rostislav Highway, please," he said peremptorily, and patted the seat for emphasis.

The gondolier phlegmatically poled.

They were soon enclosed by a dizzying swirl of sounds that poured from the waterborne apartments, nightcubs and brothels. Kaleidoscopic puzzle-piece patterns fused, gilding the surface water. The bright hydrohabs, glimpses of the beings rushing, lounging, swarming within, the sharpness of the interlocking flashes beneath the gondola, assaulted Chazak's senses. The helplessness of his situation was a hard blow to his belly. He had been warned about the fringe types, the mantises found in any avant-garde development. "Friend," he tried to adjust the volume of his voice, "if you don't mind, I'd prefer to go my way. The Rostislaw

wharf is ten minutes back and I don't wish to waste more time."

The woman shrugged. Slowly, with excruciating exactness, the gondola reeled 180 degrees. There was a hesitation, then the return began.

Chazak felt weak. He felt ashamed. His loss of control was occasioned by too many years as Seneca to a Nero, too many years the stinging wasp in a completely protected hive. The dock and gondola coupling was nigh. He groped for a koruna and change; a 50-haler piece. This he proffered to the gondolier, who ignored him. Chazak refused to beg the acceptance of his money. The metal gondola struck the metal dock with a gong.

The Rostislay tram ran a continual circuit along a single track. It stopped at every intersection for two minutes. Two steps provided access to the

sideless, six-chaired cars.

Chazak imagined how the gondolier would tell her cronies about the earthbody she had ferried from the suburbs. Anonymity was sometimes a blessing, he concluded. He happily watched Kithira's urban traffic, the clean systematic avenues, the ambulating guests as the tram trundled to his hotel. He wondered what time it was. The clocks of the cities of Venus were set by the chronometers of their respective mother cities, he'd been told. In Prague it would be morning, he reasoned after checking his watch. But time was of no significance in Kithira. His body told him he was tired. He would have to establish a regimen for himself.

Chazak found his pace, after approximately 48 hours, and enjoyed inventing his own temporal divisions. He mixed with his fellow long-term guests and resort hoppers at breakfast on his third day. An American and he were left drinking coffee and smoking the expensive Pentarchy cigarettes which the other generously shared. He introduced himself.

The American was impressed. "We have few heroes among our conquerors," he stated. "You have been a firm friend. I'm not a radical, so I appreciate the tightrope you walk. Not many have been able to stay in power's good graces while maintaining integrity and a commitment to morality."

Chazak lowered his eyelids in pleasure. "And you? By your showing here I'd say you were defi-

nitely not a liberationist."

He tapped ash; his sandy hair fell over one brow as he smiled. "I'm an official employed by Prague loyal to my land, but not believing that loyalty should interfere with providing for myself and family."

"I see. Small curs are not regarded when they

"But when the lion roars?"

Chazak projected sympathy. "You can't be judged. I'm not in your shoes. We choose our priorities and prosper as chance dictates."

"Do you know who actually owns this hotel?" the American leaned close and asked confidentially. "One of your American countrymen, I think."

"Exactly," he said, as if this ended the discus-

sion. He straightened and smiled again.

"Prague is kind to her subjects." Chazak casually dragged and exhaled, studying the aromatic smoke rings.

"Once one recognizes who's responsible for this world," the American spread his hands, "one

shouldn't be surprised.'

Chazak felt too comfortable at the moment to be lured into political argument, although he admired the American's nerve in challenging him. "Your ancestors must share that honor with others, but you know my opinion of your great forefathers."

This produced a bright-eyed smirk as the younger man extinguished his cigarette. "As I said, you

are a hero to us."

6

"By the end of the 21st century," Chazak wrote, 'Venus was hostess to orbiting science stations from many nations. Sorties downplanet were occasionally conducted. Serious plans to reconstitute the world had been considered as early as the late

20th century.

"At the start of War IV there was renewed interest in Venus. Contenders developed 'Venus plans' which were not publicly acknowledged until the Second Peace of Geneva and the destruction of American sovereignty." He put aside the archaic pen, that which he used to compose first drafts, and meditated on being content with two paragraphs when once he'd finished pages.

Chazak rose. The room was quiet, of medium size. The desk was imitation wood, pseudo-Victorian with lion-paw feet and elaborate brass plaques backing the drawer handles. The bedstead was a copy of a Napoleonic original. A wide window of eight mock, antique-glass panes framed a view of the radiant formal graden north of the baroquely

fashioned hotel.

He dressed for dinner and descended, via elevator, six floors to the elaborate dining room. He joined another conclave of strangers; five "hybrids," as they were commonly called. These, because of their apparent seriousness and sobriety, he linked to one of the Drusrian worlds—Genra, Sorfax, Ebarr, or Dhavath—and not to the more mystical worlds of Heren, Sarpan, or Barhedha. There were two couples and a male. The historian was politely accepted. He jumped the chair until his lower ribs pressed against the cloth-covered table edge.

"This is Vhetoor b'Rsat and his mate Thia, Shimtu b'Yarinn and his companion Amytha. I am Nimsan b'Lak, their chaperon," the lone male in-

troduced in Czech.

Genran; he congratulated himself on his perspicacity. "I am Josef Emil Chazak, of Earth."

Nimsan b'Lak's large grey eyes smoldered with recognition. "We have heard of you. We are honored. The Republic of Africa is allied with our home continent but we know when any world area produces a great man."

Chazak cast down his gaze. "I've heard," he switched to Anglish, the language of imperial Lagos, "that Genrans know much about the galaxy's inhabitants."

"We are good listeners. But we are not here on business. I have the happy job of escorting these young ones for the duration of their betrothal, although any information we might inadvertently overhear will no doubt please the Elders."

"Since by your obvious intelligence and bearing you too are an Elder, is it possible that you've met one of the great human beings, one whom I admire very much? Genra fared well under the influ-

ence of Strategos Agis Kasai."

"I met the general, and know him still. He will be equally pleased to learn of my meeting you." The polite Elder's full gray mouth displayed only the most pleasant of smiles.

Chazak felt some irritation, a small throb of insecurity. He decided to change the subject. "The power of wealth creates neutral resorts where enemies can act like friends, at least for a while."

"Although a 'hybrid' goes anywhere. In any case, I doubt that the general would vacation on Venus."

"Like Coriolanus?"

"Your reference touches me," said the Genran, and Chazak wasn't sure whether the other understood the reference at all.

There remained two empty places. A waiter took their orders, in Anglish, and food quickly appeared. The young Genrans in the care of Nimsan b Lak, each with the disquieting differences of the almosthuman, said nothing, as they were in the presence of a man of rank. Nimsan's large head was balding, his cheeks were hollow. Chazak assumed he was, in solar terms, an octogenarian—middle-aged on Genra.

A poorly dressed, spritely, though sad-eyed human male came among them as the meal was concluding.

"Friend," Chazak said, "welcome."

The other nodded once. "I saw you from my table and could not restrain myself. No, thank you." He exposed his palms to the perfectly fashioned waiter who had scurried over to seat him. "I've eaten, You are Chazak."

"And you, sir?"

"A soldier. This is as close to Earth as I dare

come."
"May I introduce Nimsan b'Lak, of Genra."

Chazak tilted his head in the Elder's direction.
"Greetings to a Kasai man," he said in Anglish.
He turned again to Chazak and spoke in haste. "I
served under Prague's late commander in chief.

served under Prague's late commander in chief, Belisarius. I fell with him, I went into exile with him; many did. I want to thank you, friend Chazak, for your fight." Chazak scented an undercurrent. "But you feel it was too late?"

The stranger settled against the velveplast upholstery of one of the empty chairs. "Sir, Belisarius was as dear to you as he was to me. Sedmihradsky was destroyed, there's nothing else. You, however, did not let our Prime Minister forget, and that's why I thank you."

With the supple gray fingers of one hand, Nimsan b'Lak traced the gold filigree-work of the cloak broach at his throat. He watched no one. "It is rumored that Nahum Komensky, Prime Minister of the Republic, dies of guilt as much as from an alien parasitic disease."

"Genra deals in gossip," the soldier bluntly rejoined. "A man who could order the execution of his friend and empire builder, who could stage it the way that Komensky did, doesn't flinch when memory strikes. He's afraid of what's to come."

Chazak disliked hearing others discuss this subject. "Ministersky Předseda Komensky," he interjected, "is old, physically weak, and probably insane. He has been my foe, my Aufidius, for many years. There won't be a reconciliation. And I will outlive him."

"Excuse me!" The newcomer's sudden appearance startled those seated. He stood like a Roman statue. His parts, like those of the waiters, doormen, desk clerks, servants, maids, and porters, were classical. There was not one visible law. "May I join you?" The timbre of his voice was pleasing, his manner confident. His skin shone; his blue eyes beamed with vitality.

"If you will." The nameless soldier leaned to his left as the other fluidly sat to his right.

"This seems a motley group. Čišník," he hailed the waiter. "My name is Atanas Smolenov, You I

know to be Josef Chazak. Hereni brotos for my friends, here." He swept an arm as the waiter again departed.

"Your generosity is appreciated." Nimsan b'Lak exchanged consonant glances with his compatriots. "What brings you to Kithira, friend? We heard

you were on your way to Amarna. Is this a covert inspection? Are you preparing to expose Venusian

inhospitality?'

"Twe encountered only the warmest regards since I came," Chazak answered. He was too attuned to Byzantine politics not to intuit wheedling, but it was pleasant to be considered an enigma. He was on vacation, he reiterated to himself.

"In that case, you'll forgive me if I debate. I submit, friend Chazak, that your beliefs are use-

less and foolish."

"Friend, we are on Venus in order to relish her pleasures." Nimsan b'Lak helped himself to the brotos as soon as the amber decanter was set before him. "You may love to argue, but Josef Chazak has expressed no preference."

Patrons straggled out, islanding Chazak's party. Lighting was dampened. Waiters and waitresses were posed like pieces of sculpture, queued against a wall by the bar; Narcissus and Galatea, Endymion and Anchises, Helen and Ganymede, they were motionless.

Smolenov emptied the bottle. "I'm with the Systems Development Office in the VIA in the Ministry of Colonial Affairs."

"The Venus Immigration Authority," Chazak explained to Nimsan b'Lak. "So you're a permanent resident?" He refocused on Smolenov.

resident?" He refocused on Smolenov.
"Da, yes." He pinched the goblet brim with his lips. The rusty liqueur waned below an azure stare.

There was a camouflaged sneering quality to

Smolenov's voice, Chazak thought. Worse than irony, more like aristocratic indulgence. He was suddenly tired.

Smolenov observed the soldier, the Genrans, "Yes, indeed, a mixed bag for you, Chazak, I understand

you've become jaded in your old age.

Chazak's temper stirred. "In the first place," he said softly, "I don't think sixty years is an old age. And in the second, anything you know about me is whatever the publicists and journalists decided would titillate their audience."

Smolenov tilted his head and eyed Chazak like a rooster. "Your roar grows weak," he said lightly. "Your potency is in question, your future in doubt."

The soldier pummeled the table with a fist. Echoes of clinking dinnerware shot like bolts in the mausoleum spaces of the sleeping restaurant. "The man is your better. Show respect."

"Friend Chazak knows if honesty and respect

are friends or enemies."

Nimsan b'Lak was standing. The rafters of frosty light above their table raised the alien, buried the human. Pupilless charcoal irises in wedge-shaped sockets, an elongated gray skull, large nostrils in a nonexistent nose, flat, almost boneless brows, a shiny chiseled mouth, and delicate jaw emerged as the Genran signaled his charges with an upturned hand. "If you will pardon us, friends, we must retire. It was most enjoyable, Josef Chazak. I will pass on our acquaintance." He bowed his head.

The quintet soundlessly filed toward the restaurant's large door, faintly touched, then shrouded

by the grainy twilight in the distance. The soldier was vigilant.

Smolenov nestled the knuckles of one hand in his waist, his elbow thrust like a wing. His free fingers scissored a Genran cigarette. He snorted

smoke; the fumes were powerful, "I have health, wealth, and influence because I hold ideals diametrically opposed to yours. Because I accepted those things that you condemned and fought all your life. Courtesans, friend. What's your choice—the wifely or the sultry, the flighty or the sensual? Hybrid, android, cyber, or human? There are games as exciting as combat but safe for us. Games with citizens, ordinary people. Corruption is a matter of talent, Josef Emil Chazak. The condiments of office are leisure, security, control. What can you show? Ill health, powerty, the dubious acclaim of your precious hydra-headed common man, but most of all, friend, boredom."

A spirited rebuttal was expected. Chazak, having schwed the intoxicant, as usual, made a halfhearted try at fanning the flames of his indignation but all he could manage to say was "I'm on vacation, Mr. Smolenov, I don't want an altercation."

The bovine-eyed soldier was at attention. "You must fight, You can't let words like this go unan-

swered. Belisarius died for his honesty."

His tongue felt like sawdust. His inner lids smarted as he kept himself alert. Had he noticed before? Did Smolenov have gray hair, or was it the strange illumination, so diffuse and high? His imagination, once impressed, tended to circle around and around certain thoughts.

"Waiter, vodka," Smolenov called to the entire

fixed line of beautiful figures.

The entreaty activated an auburn-haired waitress, who swiftly left her shadow-mottled companions. She disappeared into the darkness, then reappeared, was at the table. Her diamond fingernails, the transparent flask and its clear oily contents, glinted in identical starry sprays. Chazak viewed her askance. She poured; Smolenov flipped up his chin and downed the vodka. He plumped the empty goblet on the table and she poured again.

"Join me?"

Chazak and the sad-eyed soldier shook their heads.

Smolenov waved the waitress away and he sipped

the refill. "I know what men like you don't. It's better to be a puppeteer than a puppet. If only you

knew . . ." He hiccuped, belched.

Drunkenness did not become him, the historian thought. Smolenov's facial planes shifted, his lineaments blurred. The soldler had suddenly risen; he now was brusquely bowing. There were words of farewell, then a final salute jabbed at Chazak, a queasy, momentary distraction. When Chazak regained focus, the nameless soldler had disappeared.

"There are certain things happening on Venus," Smolenov lisped. "Venus is a fake lady: she's a

cannibal planet in disguise,"

"Yes, what are you saying?" Chazak was distraught. The air was overbearing with smoke and cloying cologned vapors. He made a major effort to concentrate on Smolenov and discover his gist. "What do you mean?"

"Can't tell you. This much—there have been deaths and evacuations. Many things come to me

in the SDO."

A grimning, sloe-eyed face loomed over Smolenov's modding head. An overweight body was attached. There was no uniform, yet Chazak immediately felt a military presence. The phantom bent and whispered in Smolenov's ear. "This is friend Chazak," the VIA man blurted. The other straightened, smiled into cheruist cheeks. Two more burly, stout-armed men in civilian clothing flanked Smolenov's chair. The drunken official's features seemed

to swell, grow puffy and white. He clumsily came to his feet as one of the guardians yanked the chair from between them and him. Smolenov was braced behind each elbow and led beyond visual range.

The beatific one clapped his right hand over his heart. "I apologize for my friend, Chazak. Shohem."

He backed away, his inspection lingering.

Chazak, sleepy and puzzled, returned a questioning stare.

It twinkled blue to white to green to white. It pierced the Venusian neoatmosphere with authority and beauty. Chazak, trying to think, stared at it as he strolled across the Troy's terrazzo piazza. From over meticulous, sculpted hedges, from around ornate marble corners, the frenetic noises of neversleeping Kithira penetrated, Chazak continued to peer at the horizon; Earth star, Had there been ancient Venusian astrologers, what would Terra have signified to them? Primeval inhabitants would not have had this oxygen-nitrogen bubble to breathe. He sniffed. The air was torpid. Odors of rose, jasmine, mimosa, honeysuckle, pine, seemed off, like notes played flat.

He attempted to concentrate once again on his problem. He watched the variegated marble chips that seemed to move under his moving feet. At an earlier time in my life, he thought, I would have prepared an exposé. I would have been roused: I would have expanded to full power and charged the

offending suspicion.

Deaths and evacuations . . ." What deaths, how many evacuations? Chazak pumped up his dis-pleasure; his conscience kicked and kicked at him until a halfhearted vow emerged. He would have to investigate in his customary manner.

"From 2220 to 2250 CE, Prague established her most important colonies," Chazak printed. "Wealth flowed into the coffers of the Eastern European Republic. Lagos seized South America and nationalized the resources of Earth. Riches filled the vaults of the Republic of Africa. Both empires funded research to discover means of reclaiming Venus. Both published prospecti at about the same time. Dissent from scientists, medical experts, and political economists was brushed aside by a dual restatement of the 19th century American credo, manifest destiny.

"And yet, it was claimed, experiments were already underway within the Venusian clouds. The rape of Venus, it was called. Governments blamed Muskovy and Washington. Alert observers saw this as scapegoating to cover for Lagan and Praguer impetuousness. Either of the latter could have been responsible for the biochemical experiments but neither wished to be held accountable. Unable to blame each other, it was convenient to castigate former foes, rebellious subjects which the present

regimes now ruled.

"In 2252, war again flared. The Kyoto-Osaka revolt was successful, with Prague as a covert supporter. The Muskovite resistance failed but Prague lost several colonies. Then Khepri Privna's Omorkan usurpation preoccupied the poleis. In 2260, nations returned to more peaceful pursuits." He came to his feet, massaged his lower spine. Outside his window, silver nocturnal mists curled and hovered, reflecting the light from his room and blocking any view. He decided it was time for breakfast, and he accordingly exited.

On the ground floor, as Chazak passed the visi-

tor's desk in the central lobby, he was fingersummoned by a man behind the micaplast, verde-

antique-colored counter.

"Friend," the hotel official said breathlessly, "I'm pleased to inform you that your room has been changed, with your permission. We have given you one of our penthouse apartments, identical to but larger than your present quarters."

Chazak registered surprise. "Why?"

"You are appreciated, friend." He broke into a nervous grin.

"Forgive my rudeness. I'm Brutus Lobaugh, man-

ager of the Troy. I hope you will accept."

Well, and why not? Chazak thought. What was so unusual about it? Hadn't he earned some special consideration? It isn't matter of deserving, another inner voice retorted. An impeccable social consection has been in the interest of the social consection and the matter of the social consection. The special consecution is social consecution. The special consecution is social consecution.

Breakfast was a gourmet spread, "compliments of your host," the beautiful maitre d'explained between numerous pearly teeth. Chazak had the

table to himself.

Three hours later he began a gondola trip west on the Adonis Canal, northwest up the canal Hesperus. Canals had been sliced into the Venusian surface by all the mother cities. Perhaps this was initiated by the American Pentarchy in a romantic mood. Chazak had speculated on a more psychological explanation: Mars had not yielded any mythical canals and human beings had not forgotten that disappointment. Without any debate, by a kind of silent agreement among the powers of Earth, Venusian reconstruction had included an intricate network of wide waterways.

Chazak remembered his self-promise to investigate Smolenov's allusions. He settled into his soft velveplast seat and watched the brightly lit docks undulate by. The gloomy park foliage beyond the banks of the Hesperus jutted in and out of bright ovals of lamp glow. His gondolier was steadfast, silent. The dark heavens above were layered with limned streaks of clouds, like different-colored piles of oozing gel.

—And Smolenov's drunken hint. Chazak leaned slightly to the right and looked into the water. The Hesperus was like molasses, yet it blistered into tiny mounds, rolling like oil and springing in rapid peaks. Perhaps it was blue; a cyanic patina seemed

apparent through the evening shadows.

Should he interfere? Should he jeopardize his vacation? Chazak straightened in his seat. The perfumes of orchids, water lilies, jasmine blossoms, spices, and incense mingled, and still there seemed to be a sour edge, like excrement swept under the rug.

Who was really responsible for his room, for his preferential treatment? On the right shore, individual lawns sloped upward to palatial dachas and behemothic mansions whose facets were bejeweled by thousands of tiny electric stars.

No, he decided. He was on vacation. There would be time enough for muckraking when he returned

to Earth.

9

In the hotel's lounge, while awaiting the dinner call, Chazak was hailed by the corpulent official who had intervened during Smolenovis drunken revelations the supper before. "Ovidiu Teodor, here." The other grasped Chazak's hand, dropped it. "To make amends, dine with me as my guest. You've perhaps heard of the Phaethon?" He patted his belly.

"It's supposed to be the finest restaurant in

Kithira, if not on the planet."

"'Supposed to be' will be your most memorable understatement, friend. Come with me." He briefly hooked one of Chazak's arms as impetus until the historian accompanied him of his own accord.

The car they used was the deluxe Pichlavy-Kladivo model, called a Prima. Chazak was familiar with the vehicles; he'd written about them in treatises aimed at Pichlavy family bribery. Most office holders of the Republic owned a Prima. Teodor's own now sped topless along the Avenue Slunce—pronounced Slune-fee by Teodor—hitting air but leaving no wind-wake. Chazak reclined in the left seat while in the right his host folded his arms to demonstrate a mind-patch. The car zipped a meter above the narrow slash of leaden highway surface. Teodor disengaged, set the car on auto, and their headlights shot eastward. The horizon soon melted into light.

Chazak became absorbed in watching the growing visible crack between the phosphorescent line of Venusian land and the man-made night sky. Within this urine-colored reprise of the sunset, stratus remnants whitoved and writhed like snakes in

some terrible throes.

"What is that?" the historian wondered aloud,

feeling ill at ease.

"Normal, perfectly normal," Teodor said, as if talking to a child. "Something to do with the induced magnetic fields. We're close to the pole, you know."

"I see."

The car slowed, pivoted south onto Prastary Highway. Teodor rested his arm on the door. His hair

was surprisingly motionless. He turned to and smiled at Chazak. "I must apologize again for friend Smolenov's behavior. He usually isn't, in fact, to my knowledge, has never been, indiscreet.

Implying that he knew what he was talking

about.

Teodor continued to smile in his patronizing way. "There is only beauty and pleasure on Venus."

Chazak remained outwardly tranquil. Within the privacy of his skull he experienced a stab of excitement.

"No mysterious happenings, you know...." Teodor began.

Cover-up, Chazak thought. The bureaucrats on this sister world feared his reputation. His groin ached, his stomach twisted, his heart danced, Such inklings of crime had at one time hardened his nerves after offending his senses. Now he felt as if he were about to watch the next act of a pornoplay. The words "you can be our friend" echoed from all sides of him like the voice of a nymph both fleeing from him and beguiling him into her pool.

Then Chazak was watching himself, the audience and the actor in a dim parabolic theater: brown confusion and green shame pervaded the dream. Golden voices, twisting clouds, the face of Ovidiu Teodor, too much liqueur, the Phaethon, the bodies of people piled into a heap as they all crashed against the door slammed by his waking

self against his subconscious.

It was the time he'd set for rising in his lurid, Venus-tainted room at the Hotel Troy. He sat abruptly, his head pounding behind his eyes. Did he indeed drink too much? He remembered the promises of future feasts, the strange warmth of the brotos. Why hadn't he resisted? Surely Teodor knew who he was, what he represented.

He alighted from his massive bed and wove his way to the bathroom. Instinct had always reined him from disaster, he rationalized. The hotel room, the victuals, the slithery attendants, sexual favors; why not, after 30 years of stoicism and virtue. "Is a man always judged by his weaker moments?" he rhetorically asked aloud as he watched the urinal's contents silently and instantly whirl away into the Venusian depths.

He took a chemical bath, dressed, and scoffed at the oversensitive, priggish young Chazak. "Such insignificant examples of favoritism can never shift the scales against a lifetime of devotion to honesty," he said to himself as he pressed closed his favorite iacket and smoothed back his sah-streaked

hair.

## 10

The window gaped open. The two four-paned sashes strained like wings into the Kithiran evening. The tenebrous air entered and filled the apartment. Twenty-four hours separated Chazak's adventures in the restaurant Phaethon and this abrupt awakening. He sat up and choked, his lungs heaved, bringing mucus into his throat. He found his footing and stumbled from his bed to the micaplast sill, which he clutched as he coughed spasmodically. From without, he heard the hacking and gasping of other hotel patrons.

The Venusian atmosphere milled and swirled as if the verse searching or inspecting his room. A canker-colored mist veiled Chazak's eyes and he unconsciously brushed the bridge of his nose to wipe away any obstruction. He wagged his hand in front of his face. There was no movement of air, not the slightest breath. He drew the casements for

with a crash and fastened them. Silence followed. then the purified hotel atmosphere serenely whis-

tled from the ceiling vents.

Chazak stood and watched through the distorted glass. He couldn't be sure whether the contortions that blotted the sky belonged to Venus or were his illusion. There seemed to be a gathering, a coiling at the latched halves of the window. Chazak, still coughing, backed involuntarily toward the center of the room. Discolorations blotched the panes as if a lost soul were pressing palms, lips, and a forehead against them, begging for admittance. Chazak closed his eyes and spun toward the bathroom, hurriedly preparing to dress.

He didn't understand what was going on; he cared less about his recent debauch. All that mattered now was his health, which was threatened. He feared sickness as a man whose antagonist is fatally stricken doubts being spared. He packed, avoiding breakfast, and announced at the visitor's desk his intention to depart Kithira, Venus, and

return to Earth.

"But friend," Lobaugh gave him a smooth, gentle smile, "there is nothing amiss. Listen." He indicated the meter-square screen inlaid in the synthetic marble wall to the right of the desk.

An anchorman, his talking head displaying blond locks, eyes with a champagne sparkle, a mouth curled superiorly, reported sunny news from the vast empire of the Republic. Then news of nonaligned regions and worlds, and finally, the latest bulletin on Prime Minister Komensky's condition: "unchanged." said he. Venusian anecdotes closed the broadcast.

"You see, not a thing to worry about." Lobaugh spread his hands. "Aberrations occur, but either pass quickly or are quickly corrected."

Chazak's luggage was stacked at his side. He turned to tip the handsome clerk. When he returned to the Troy's manager to begin a protesting argument, he caught Lobaugh finishing a telecommunication. The monitor behind the desk winked out. Behind it, nine other active screens forced Lobaugh's figure into silhouette as he carelessly or carefully blocked them. Chazak sensed delay, smelled secrecy. "I'm sorry, Mr. Lobaugh, my respiratory system is delicate." That isn' true, a voice inside him said. The truth? The truth was that he was afraid, and it was a fear he dared not misinterpret. "If you will please have my bags carried to the tram...."

A white-haired, stocky male tapped his shoulder. "Josef Chazak? I'm Albert Janda, with the Ministry of Internal Affairs. I'm sorry to hear of your distress. Do you think you could delay your leave-taking a little while, long enough to be my guest?" The tone was singsong, condescending.

Chazak should have been angry, but instead, much to his surprise, he felt relieved. "Your guest,

friend?" was all he could muster.

"There's an exclusive spot, a club we call it, for the Ministry's employees; the Paphian Club. We'd be honored if you'd lunch there with us. It's north of Kithira. It will take you away until this inclement weather improves." Janda's eyes narrowed and wrinkled at the corners, his cheeks stretched and dimples appeared, but Chazak looked in vain for the smile itself.

### 11

The Club's cross-vaulted dining hall was fitted with tiled floors and walls, fenced by French doors, and cradled by an imported Genran garden. Inside, the buffet was elegant, with foods and dishes putatively from the reaches of the empire. Multicolored and rare beverages spurted out of giant fountains shaped like alien beasts. The cloths and

napkins were cut from Borsippan silk.

Officials in business suits, army officers, staff, male and female, swarmed immaculately. Smiles, twinkling eyes, little kisses, and sincere handshakes formed the connective tissue around Chazak as he and his host, followed by a waiter carrying their selections, threaded among chairs to their table.

Chazak wasn't hungry. He politely nibbled on

slices of Dhavathi cheese.

"What a beautiful city Kithira is," Janda asserted between swallows. "What a miracle, our Venus achievement. There's nothing a Terran can't do."

This spiel was an abrupt intrusion and thus a blatant prelude to a more delicate subject. Chazak was aware of his slipped timing. He used to know

the exact moment to wield the knife.

"Friend Chazak, we're honored," Janda continued, "really so pleased to have you here. You're respected by everyone, even the opposition parties. One can disagree with a being's opinions, but who can deny a man's life? You've lived your convictions." He stuffed food in his mouth, chewed.

Chazak's ears burned, his temples pulsed. Yes, he mentally exulted. His singular achievement was recognized. The attention and flattery were ambrosia to a brain scarred by the peculiar wounds

of the intensely self-critical.

"Cytherea is born, rising from a chaotic sea ready for her ascension. The governments of Africa and our Prague are preparing to reclaim the south, where the armies are. Planet shaping—like gods, friend. We can remake worlds. Venus was our laboratory, She is ours and we have made her beautiful. We have lifted her face, sculpted her figure, softened her skin, regrown her hair. Mankind has dispensed with age and ugliness. This is a planet of loveliness and refreshment. The Ministry of Internal Affairs, the Ministry of Colonial Affairs, and the Army of the Republic are indeed privileged to welcome you, to care for you, to exalt you." He slurped Elpidean wine. "Stay. Stay with us. Do not desert Kithira."

### 12

He was once again apprising Lobaugh. The manager sighed and wiped the perspiration from his upper lip like one unburdened rather than grateful for a famous patron's return. The Troy glowered around them; the blond newscaster continued to project happy events. Chazak choked on phlegm, coughed. His valiese were by the desk, where he had left them. He hacked again. The guests paraded to the various lounges; the Kithiran vespers commenced. Albert Janda reappeared. "Ah, friend Chazak, how impolite of me. I completely forgot. I'm having a get-together tonight at my dacha. My) not come—to meet some of our local VIPs." He winked

A human couple approached the desk, next a party of three. "There seems to be a virus going around, our waiter told us," the husband half of the duo said to one of Lobaugh's assistants behind the counter. A youngish woman among the triad agreed, added, "We were told to pick up medicine here."

"Of course, quite annoying sometimes," responded the brunette female beside Lobaugh. She and the manager exchanged condolatory expressions, "Here,"

"It's nothing." Lobaugh extended his lower lip knowingly. "But perhaps you'd like something for that throat, friend,"

Chazak watched the girl set several small, plastic bottles in a row along the counter's brown and green surface. Bright primary colors reflected as smudges in the polished micaplast. "What's in the capsules?" he asked.

Simple oral vaccines, tranquilizers, and antihistamines." Lobaugh winnowed three vials for

Chazak.

"What do you say, friend? I'll have a car for you at 2000 hours, Praguer time. By the way, do you have a traveling companion?"

The old Chazak bristled. "No."

"Ah, that can be remedied. You want her, or them, to be beautiful, intelligent; for the duration of your stay."

"No." he repeated.

"For how long, then?" Janda prodded.
"No, nothing." His heart drummed, his crotch throbbed.

"Human or cybernetic? Robot-bonded are the

most interesting."
"No. Nothing," he muttered. The five guests glanced at him as they retreated with their nostrums.

Janda nodded. "I understand." He panned the crowded lobby; his features contracted into an insinuating grin. "We'll do our bargaining in a more private place.

"I said no," Chazak insisted.

Albert Janda pressed an index finger to his lips. "We'll talk tonight." And he was gone.

Lobaugh obsequiously leaned forward, hug-

ging the counter. "Your suite is still unoccupied. We'll have your luggage brought up. Don't for-get your medicine." He moved the containers a fraction.

With one sweep, Chazak angrily fielded the bottles and dropped them in a pocket of his greatcoat. "Thank you," he whispered civilly, his temper

barely checked.

Wandering toward the elevator, he bumped and brushed through biped clusters. What was happening to him? He pondered himself with amazement. He had just been piqued by such a harmless manikin as Lobaugh. He wanted to find Albert Janda and make him wait for an answer. Yes, he would come or no, he could not; once he had been an expert at detecting and stopping a steam-roller. He used to successfully parry such attempts to back him into a corner, socially or politically. Chazak vaguely understood that he had fallen into a netherworld between coercion and free will.

Abruptly, the theme of his inner dialogue changed. The thought of lovemaking rushed up almost brand new. Since the death of his wife, he'd had neither the time nor the opportunity to establish any stable relationship. And the casual encounters had seemed to him to be embarrassing, insipid, or

depressing.

The memory of a musty, heady smell set him shivering. He made an effort to bridle the ghost. His mind broke through its bonds, and painted Lobaugh's brown-haired assistant in pink-tan with heavy breasts and a honey triangle between her thighs.

Chazak's eyes stung as he entered the elevator. The metal box ascended with one Agonistes and a load of indifferent Philistines

load of indifferent Philistines.

Kithira was well into night. Inky swatches, like scabs obliterating the stars, sporadically appeared and disappeared. Chazak reclined in a chaise longue on a brightened deck. To the rear of the deck huddled jungle-park, and to the fore muddled the Adonis Canal. Other guests-Terran families, newlyweds, outworld and alien tourists, military personnel, the skim of the so-called empire-surrounded him, playing, laughing, imbibing, singing. Children screamed, scuttled, gamed with whirling, bouncing, clattering gadgets. The gauzy air was less abrasive. Even so, Chazak observed several in his vicinity who tried to suppress asthmatic gasps. Resting on the circle-top table which stood by his ear were his three telltale medicine bottles, duplicated hundreds of times alongside respective owners who like himself were tired of being imprisoned inside a hotel.

He was compelled by his position, and inclination, to watch the spotted sky. The activity around him lost itself in a steady buzz, the twitters and ruffling of feathers, hoots and clacks from the vegetation behind him lowered and lowered, the sounds becoming synchronized. Chazak was dressed casually in a summer suit but recurring bouts of a generalized agitation had overheated him. He quenched another flurry of nerves and stared at the suns beyond the Venusian stratosphere. He thought of the mythical judgment of Paris: the golden apple, Hera offering him power and wealth, Athena glory and victory in war, and Abprodile

the fairest woman for his wife.

He had chosen: he was alone again. He had

He had chosen; he was alone again. He had lowered his own sword in that dacha amid those strangers who now called him tovarich. He had stepped over the edge, meeting the chief of the VIA, the head of the Department of Venusian Affairs, which belonged to the Ministry of Internal Affairs. There were Defense Department officersmarshals, colonels, and generals. There were secretaries, undersecretaries, assistant undersecretaries of the Systems Development Office, BFM-the Bureau of Family Management-and its spawn, the Departments of Education, Socioeconomic Progress, Charters, Processing, and Public Relations, were represented by chairmen, managers, and staff, From the Department of Venusian Affairs-Management and Budget, Transportation, Sewage and Waste Disposal, Water, Health, the Department of Finance-white-toothed, positive-eyed young bureaucrats chattered and shook hands, slapped scapulas, and maintained the right attitude. "Development Programs A-Theoretical Studies," quoted scientists, happy sinecures. And "DP-B-Approved and Implemented," said engineers, architects, business moguls, Komensky's men and women. "My enemies," he, Chazak, once had said, "past, present, forever.

Pentheus, stubborn and proud, broken by his cousin Dionysus, was played with first like an insect to a cat, and while finally viewing the Bacchae's rites met his horrible death. He had been understanding of, yet undaunted by authority. He had sympathized with his enemy's point of view while knowing he was honorable and would not surrender. But now here was that duality contained in one, acted by himself, for himself, with himself. Chazak's frame shook, a quake that shattered ego and courage.

The logic was inescapable. Uroboros was eating. Chazak the prophet and critic had believed that his virtue would prevail and Komensky would fall.

But that conflict was enacted anew, his own soul was poisoned, and now it was past, present, and forever that Chazak prophesied against and criticized Chazak.

# 14

Time spilled from a pool that had overflowed. It seeped through cracks and across floors, around window frames and under doors. The Kithiran environs grew foul. Half-seen tinctures blended into unclassifiable colors, as unaccountable as newborn clouds instantly ripped asunder. A wail echoed continuously in dreaming ears.

"By the year 2275 there was progress. Whether due in part to the long-dead experiments that succeeded after 200 years, or the result of recent breakthroughs, no one could or can say," Chazak continued. His gaze fell again on the two 20th century British first editions that the head of the Department of Interplanetary Trade had given him.

"The combination of microorganisms and inorganic compounds destroyed enough cloud cover to permit the planet to lose heat. It then rained on Venus. Steam banks billowed, jetted, mounded, and it rained once more. With human help vapor was electrolyzed. Oxygen collected. With human prompting an ozone layer was established. It was said that the reaction tests were thorough and conservative. Changes and potentials were measured. Water puddled, the climate seemed to stabilize." He reassured himself that the exotic motopainting from Braea, the one that Teodor had given him, was still propped under the window sill. This led inevitably, against his will, to a quick look at the glass window panes. He hadn't unfastened these since that first seizure, however long ago-to keep

something out, to protect himself from ghosts that

pounded for entry.

"Research colonies sprang like tumors on the Venusian surface. In 2278, another dose of chemicals was infused into the planet's system. Sol had entered a quiescent phase. The world-shapers rejoiced; they announced their success. The temperature plunged: 60 degrees Celsius on a night side, 150 degrees during an equatorial day. In the comfortable polar regions, creation proceeded at a more rapid pace. Science became a shield, a disguise that served the governments while they monitored Venus' commercial and military value." Chazak fondly touched the Early American silver flagon presented to him by the owner of the Troy. "No." he said. "Too harsh." He scratched through the last sentence.

"Publicity preceded construction. Venus would be a resort for the elite and an economical holiday for the lower classes. To the Republika, she would be fashionable, to the Republic of Africa, spartan and wholesome. Minions not influential enough to have second and third residences on Altair beta or Barhedha would be able to afford Venus." A tone in his ears, the same that stuck like a needle in his brain when the nightmares ceased and he was grabbing at consciousness, interrupted him. He grimaced like an animal, his teeth bared, his nose and eyes a mass of creases. Then there was emptiness, which began to fill with a sorrow for nothing

he wanted to rehash.

"At this point, specialists protested. They insisted it was premature to consider general human settlements, Public opinion, however, had been baited.

"The two major powers, and many minor powers under their control, staked their claims on desirable real estate. Masculine competition promoted a masculine technology to cope with Venusian particulars. In 2278, the average night temperature of polar and subpolar latitudes was 25 degrees Centigrade. The first viable towns were built. These were protected by great mechanical stupa-domes that ticked closed and open with the planet's crawl, following the giant solar disk, shading the colonial landscape, dipping and withdrawing into opposite hemispheric trenches as darkness once more approached.

"When the age of Komensky and Belisarius—the 24th century—began, the business of Venus was well under way. The planet was declared safe,

certified by government and industry.

"Nevertheles, civilian scientists raised doubts. Studies yielded more and more complex results. Venus became less pat. Certain locations were discovered to be under a peculiar kind of stress. The fortified water, formulated atmosphere, tempered crust, bulldozed hills, blasted mountains, excavated lakes, drilled canals, carpeted ancient seabed plains, dyed sand, fertilized patches brimming with alien stands, transplanted fauna within narrow canal strands—all that was glued, soldered, fused, stitched, polished, and painted reacted with the primal world in ways baffling and unpredictable.

"The issue devolved into a Gordian Knot, and like the original disentangler of that original dilemma, Nahum Komensky swung and sliced. He declared a moratorium on investigations by civilian independents, Josef Emil Chazak made his parliamentary debut defending the University of Prague's right to persist, to find the truth; pravda vitezi." No, he thought, that implied Prague and Lagos were withholding the truth. He didn't want to offend. He struck the line beginning with himself.

15

Prague's clocks chimed; numerals raced and repeated across the face of Terra's chronometers. There was no escaping the skein on Earth. As he passed through the central lobby, Chazak jauntily, knowingly greeted Lobaugh's brunette and honey assistant, but before he could say anything further, he was arrested by the golden newsman's voice and he stopped, his body becoming rigid.

"... say that the Prime Minister's health has taken a turn for the worse. Yes, my friends, Ministersky Predseda Komensky lies near death today. In Prague, the 18th day of September, 2350, this

is . . . '

For a moment, a flood of emotion inundated him and he couldn't move. He remained fixed upon

Venus' only channel, pretending to listen.

September, he swiftly calculated—it wasn't possible. Why wasn't he home? This was the victory of nature, of the impartial dictum that humans could not defeat. Nahum Komensky—for almost 3,000 years, the planet Earth had not seen a single man hold such sway. Komensky and Belisarius had perceived the infinite measures, codified them, and brought the empire into flower. After Belisarius, only Komensky, now to be felled by an allen disease, despite human endeavor. Were there others, living in a radius of thousands upon thousands of light years, who could cure him with a touch? They hadn't lifted a finger. There was a tragedy here. Chazak wept, a brief autumnal shower.

"My nemesis, my foe," he said aloud. The Troy's guests quietly moved about, oblivious to him, to the news. He was suddenly resolute. He strode to the visitor's desk. "This screen must be tuned to a channel from Earth. The Praguer citizens must

keep their vigil. I'll order every public place in Kithira to do the same."

Her fingers continued to guide flimsy plastic sheets through pink beams, press levers, while her eyebrows arched and her gaze shifted. "No one here cares," she stated.

"I'm sorry. But this is Prague's news service on Venus. Perhaps in one of the other colonial cities ..." Her digits were flying, and it was difficult to keep track of them. Chazak abruptly shuddered; on the rear wall monitor, three from the left and two from the top, was Josef Emil Chazak, his white-knuckled fist cracking on the counter.

"He's our prime minister," he protested. But his sense of urgency was already a mystery to him. He felt uselessly conspicuous.

"Now, what appears to be the trouble?" It was one of the VIA's public relations men. "We'll do anything we can for you, friend Chazak." He had rounded the wall-corner hurriedly. He fanned splayed hands in a negative-positive gesture.

Chazak wasn't surprised by him, by his cheery complexion, by his Apollonian physique. "Nothing, Yes, you are correct. This is a place to forget."

"Anything you say. We'll do our best to serve you." He pressed his hands together, prayerlike, at his breast.

"Such contacts with reality must be anathema here. I used to think..."

"Whatever you wish." The man winked.

### 16

Albert Janda was more than "with" the Ministry of Internal Affairs, Chazak discovered. He was the

minister on Venus, and thus Prague's absolute civilian authority beside his equals from Justice, State, and Colonial Affairs. Chazak apologized, wondered

aloud how he'd overlooked this fact.

"I've worked at keeping my head down," Janda offered. He moved away to greet new arrivals. His dacha was more remote, more exclusive. The modern "art techno" interior was completely insulated. A comfortable hum, the telltale of a security shield, reached Chazak.

Eventually, 20 men and women sat at an elliptic table. Terran wine was served. Janda stood, extended his glass. "News has just reached me." The tone of his voice snagged their attention. It was pontifical. "Our prime minister is dead."

A cough, mumbling, scuffing bridged the pause.

A cough, mumbling, scutting bridged the pause. "September 22, 2350, 4:04 in the morning. The king is dead. Long live the king." He guzzled the rare Burgundy from Prague's French provinces.

After a chorus of grunts and tinkling glass, the speaker slithered into his seat. Chazak's wine remained untouched. His widened eyes locked onto Janda. His nerves crackled.

"Which is why we are gathered. Who is moving where, friends? Which pieces on the board will change position? We are on the skirts of the cyclone and we will prepare for the storm."

"We must keep our heads until we're ready," a

general cautioned.

"Belnotti," Janda ordered, "determine who in the Justice Ministry has unemployed favorites. Yosefousky, I want to know which titles and offices are available, which Parliament will eliminate, and which will be consolidated. IJyushin, I want an analysis as to who will win the tajná policie. This is essential—the secret police are the handle. Kubasek, find out which officials might change jobs, and how much their loyalty will be worth"

Worth.

Chazak's stare broke. White light glaring from

the bare metal table absorbed him. Why am I being allowed to listen? he raged to himself. Insecurity climbed his spine, despair raked his bowels. Don't they realize who I am? he thought lamely.

"This is for us, the rulers of Venus," Janda again

proposed a toast.

"In self-defense, we do what we must," Teodor

seconded, and swallowed.

Josef Emil Chazak, historian and crusader, found himself with a companion during the drive back. She was rose-cheeked Hebe, his cupbearer, goddess of youth. "Are you human born of human?" he asked. She flung aside a tendril of her buttery hair. Her smile was pink like an Aegean dawn. "Ask my mother," she said lightly. She snuggled Into his grip as the driverless Prima raced south toward the Hotel Troy.

### 17

His impulses, his emotions seemed miraculously redirected. Like a thirsty animal, he lapped her offering in the belief that such conferred immortality. He tried to remind himself that Hebe was a fine gift, like the painting and the books. But she said that she loved him. How lithe her legs were, how soft; she was a receptacle that absorbed great discharges of energy and grounded them, made them harmless.

As the satiny, snowy flesh melted along his worn side, as one downy arm rode his rising and falling rib cage, Chazak, his guard lowered, turned his head and looked at the window. He slowly sat up. Her arm dropped to the bed but she didn't stir. Chazak, naked, came to his feet. A chill sweat shone on his skin.

He was sure he saw ghosts—dancing female ghosts, cloudy whirlings, a frantic dance of phosphorescent shapes—in the air outside the panes. He reached the window sash, his hand trembling. He almost thought he heard someone say "open." He froze in consternation. He could see that the distant horizon was aflame. Green, red, violet bands vibrated, spiraled, thrashed. A bitter odor came to his nostrils. He unlocked the window, threw open one side, and jumped rearward, as if expecting an animal to snap its jaws at him. The tormented air flew into his face, grated down his windpipe. He wheezed and bent double, staggered, grabbed and relocked the window frame.

She leaned languidly on one long arm, her cream shoulder thrusting, her breasts glistening. "What's wrong? It's only our aurora borealis. They did

something to the magnetic field. . . ."

Chazak straightened and gazed at her. The picture of her sensual body lounging against rumpled, silky sheets on a massive antique bed was one that had occupied artists for centuries. Yet she was more than a scene framed by his eyelashes; she was a charge of pleasurable feelings that overrode all of his senses. When she beckoned him to return to bed, he obeyed.

# 18

Alone at breakfast, Chazak scanned the dining room assembly: sallow faces and red-rimmed eyes counterpointed vacation patter. Rasping and soughing accompanied the scraping of flatware.

After breakfast, he visited the Troy's highly re-

garded cosmetician. His hair had grown unruly. he had noticed, and it needed a trim.

Chazak sat, sat Chazak: the two, one body and the other reflection, contemplated each other, "I don't really see the need for neatness. The Rome of the Proconsuls and Senate is dead," he said to the mirror.

The stylist wielded the trimmer. Hair dissolved in the tiny laser maw. "Friend, you are Herr Chazak?"

He hesitated. This name semed remote, on a

superior plane. "Yes," he answered. And to change the subject, asked, "Do you know what this virus is that's affecting Kithira?" "The virus, ha!" The fine-featured cosmetician

guffawed contemptuously.

And so? Chazak asked himself. The image sitting opposite him was now groomed but thinner, with eves slyly narrowed sending ignoble rays from the socket corners.

"Nothing else, friend?" the other's smocked, precise reflection inquired. "We can do anything.

"Tell me what this virus is."

He shrugged, sensing the moment wasn't ripe, and began replacing his tools. An orderly removed Chazak's bib, brushed him off. The historian clambered from the malleable cushions.

"It isn't a virus, is it." This was heavy-handed. Chazak, however, was hungry to know. His appetites were aroused and patience was no longer one of his virtues.

"What are such things to me? Now, if it's your rejuvenation we're talking about ..."

Chazak pushed a koruna tip into the man's hand and exited.

Along Rostislav Street, past the Zlaty Inn. the Juventas and Astraeus Hotels, to the intersection and north up Aristos Avenue, Chazak walked. He aimed for the church museums and the Bohemian life that surrounded them on Kral Plaza, A stale, sometimes rancid odor burned his palate. The avenues and potpourri of architectural styles he passed, the pedestrians, cruising cars, and scudding trams were washed with erratic brush strokes of bright. reflected colors. Among the buildings and paved areas, undeveloped lots swirled with radiant, incandescent shimmers. These gulfs of original planet, visible glowing convolutions exposed in squareacre trephinations, reminded Chazak of his visualization from the Paris' port: that of larval helplessness.

Coming toward him, meeting and colliding with him on his left so that Chazak was forced to block the man with a hand, was Atanas Smolenov, But not the Smolenov who had eaten at his table so long before. This avatar was ashen-faced, skittish, owl-eved, and balding. The facial demarcations seemed sketched in charcoal. Skin sagged at the throat in concentric tidemarks of lost elasticity. Tufts of hair were soiled gray, of irregular length

and texture.

"Prominte, friend . . ."

"I'm Josef Chazak, Don't vou remember . . ."

The other vanked himself away, contracted his shoulders forward, and darted from Chazak's range.

His feet were anchored. Bewildered, he looked in four directions. Behind, two figures dove into an unlit alley, escaping his roving stare. Across the street. MPs patrolled. On the roadbed, military traffic increased. Some of the floating vehicles were

roofless; protruding from them were helmeted heads displaying stiletto smiles, beaming over shoulders swathed in army regalia. This is only Kithira, Chazak insisted to himself. Not the colonial capital Hranice, not Budapest, Warsaw, or Prague. Again he swiveled, but the two shadows would not be caught twice. That much he knew from experience. He was angry. Hadn't he been cooperative? He was on yazation.

Chazak, unnerved, retraced his steps to the Hotel Trov.

20

In the midst of the Troy's topiary garden was a dazzling gazebo in which there were tea tables and chairs painted to resemble old wrought ironice cream parlor memories. There were no other guests. Cyber waiters collected ashtrays, cups. spoons, and other debris. One of the shambling servants let slip a waferlike plastic sheet that scooped and scooped and shoveled the murky air, gliding to land at Chazak's feet. He squatted, retrieved it: page 46 of a Pentarchy tabloid no doubt ordered surreptitiously by the hierarchy of the Troy. In Anglish, the date stood September 26, 2350. Columnar tailends of articles revolved around Komensky: his funeral, birth, career, opinions of others-Josef Emil Chazak not included, as if he too had gone into the tomb with the glass-faced casket bearing the solemn corpse-and speculations about the outcome of the power struggle. Tucked into the right corner was a shaft of print complete unto itself: "What Price Venus" led into two paragraphs. "There are rumors," he read, "that something is wrong with creation, something unforeseen has happened." Had she been an orb awaiting man's fertilization, or had parthenogenesis occurred: did a life form exist? "The air and water decay as rapidly as engineers try to replace or revitalize one or the other. Witnesses returning from this paradise world have testified. Hybrids capable of psychic contact—Sarpanis and Barhedhans who frequently encounter nonhuman phenomena—have corroborated reports. Fears of hauning spirits, of being watched and controlled, nightmares, physical upsets are common complaints.

"Prague," the anonymous writer argued, "has always expressed concern for alien life. Why, then, has Venus become a media black hole where news goes in but none comes out? What is the danger to travelers and emigrants? What is being done to find answers? Is the military aware of the Venusian plight? Will the people be the last to hear?"

Chazak was flushed with excitement. He recalled his own experiences with the inexplicable.

The cyber glided to his side. "Sir," it intoned in Anglish, "may I have this, please." One buffed arm, one claw approached.

Chazak hastily returned it, flicking his fingers as

if the sheet were contaminated.

Once, he had been the sieve through which information dispersed for the people to digest. Now holding the power of knowledge, enjoying his share in the charade, he contentedly watched as this chance evidence was returned to oblivion.

# 21

Prowling the hotels, the government complex off Brav Avenue, Chazak asked suggestive questions. In his accustomed manner but for his own prurient purposes, he prodded the smaller fry. He relished seeing the lesser fish squirm. Answers were, as he expected, misleading or outright lies. I know the truth, he silently boasted. He leapfrogged from one identityless bureaucrat to another. He started on the lowest ranking officers of the army, a far more dangerous gradient to attempt, but he was an addict, his desires were to be satisfied.

Kral Plaza was triangulated by the museum replicas of a Golden Dawn Temple, a Western Roman Church, and an Eastern Orthodox Church. It was paved in authentically dappled synthetic brick. Chazak had stopped in one of the Plaza's open-air cafes for lunch. He was at the table closest to the artificial laurel hedge. Several meters away, on the plastibricks of the Kral, touring actors were setting up, the plastic laurel their proscenium. An illuminated portable monitor was erected. The large screen displayed:

## THE SAKANA PLAYERS PRESENT THE FISH, THE FOX, AND THE HOG BY N.N. SHELTEMA

Sheltema was a late 21st century Czech playwright, Chazak knew. He had written magnificently simple Noh plays for a troubled era. No elaborate gadgetry, no input other than that of the musicians and actors was required. The makeup and costumes were half-melodramatic, half-clownish. Instrumentalists and a chanter formed a double row not far from Chazak. He identified the wood block, flute, drums, bells.

Komensky's death, the political volcano, made an appropriate backdrop. The misbegotten aurora of Venus bathing neoclassic pediments, flying buttresses, and onion domes in moving, lurid shades was an apt set. The cafe's lighting cast far enough but not strongly enough, so that the players were clearly visible but not sharply detailed. Their pancake white limbs and faces gleamed morbidly. Chazak carefully looked at his moist, ticking hands as they straddled a glass of *brotos* on the table before him.

"In our day of destiny, the Fool, the Master, The sec-re-tary," the chanter introduced. The blocks cracked, the bells jangled. Act I, a dance and a drama, commenced with slow, stylized movements. A group of diners arose from near the hedge and quietly moved to the rear of the restaurant, where they resumed their seats. Windy comments issued from others still seated. Some laughter; the players seemed used to such inattentiveness.

Chazak was jolted as two agate-eyed men converged at the opposite arc of his table. They lowered themselves into chairs, an extra having been dragged from a neighboring set. "I'm Lieutenant Kestler and this is Sergeant Barbosa," one said.

using Slavic, "You are Josef Chazak?"

He could not distinguish between them in this waking dream—two square jaws, two crew cuts, two uniforms. His chest pounded. "Citizen Chazak, at your service."

"We are aware that you've been asking ques-

tions," the lieutenant said mincingly,

"You've been to offices in the VIA, the DVA, and the Ministry of State. You've detained soldiers on the streets, in the shops, on the tram," the sergeant recounted.

"We want to know what you have in mind. What do you intend to do with your information? Have

you been cagey all this time?"

The flute was mournful; its low, humid song descanted the disdainful bongs, arrhythmic drums, and intervening clacks. The chanter finished; there was a pause. Performers ossified while the pop-

pop of a half-dozen nonchalant palms rent the stillness. Then, "A third of our play is done. In Act II the time of the Fox has come. We give you the La-bor-er, a Ma-gi-cian, and a Judge, and last the Pol-i-ti-cian." A double whack, the flute, a high ting. and the dramatis personae eased into action.

Chazak smiled crudely, tapped a fingernail against his glass in keeping with the chanter and his own

heartbeat. "I don't understand."

"Teodor and Janda were pleased with your progress. Their report . . ."

"Report?" he repeated in a monotone.

The lieutenant became even stiffer. "The army outposts on Venus are the Republika's most important camps. With the helm in turmoil, our rudder-less ship is vulnerable. Our allies, enemies, and the nonaligned are waiting for a resolution. Neo-blomney, Jamka Tábor, and První Tábor are as near as our war machines can come to the homeworld. If the armáda is needed to forestall Lagan intervention or traitors of the Republic, the Venusian units will be called."

"Is it the time of the Caesars already?"

There was no change in the sergeant's demeanor. "When the next Prime Minister calls, we will obey."

The lieutenant was on his feet. "Will you betray or help maintain the security of the Republika?"

The third act was underway—the General, the

Magnate, and the Prime Minister.

The Republic by that name or in any condition

would survive without Josef Emil Chazak.
"Your answer?" The sergeant was beside his

superior.

At the loss of one purpose, a wise man clothed himself in another. Achievers were capable of choosing realpolitik. To join his former enemies, to be a

rose without the thorns, did not necessarily refute pravda.

The Prime Minister, his joints joined by geometrically crossed strings to the fingers of the General and the Magnate, worked his painted smile. The chanter simultaneously produced the couplet protestations of innocence and freedom.

"Of course I will help you," Chazak said, almost impatiently, "I'll be glad to aid my government."

## 22

In the Kithiran office of the Defense Ministry, First Lieutenant Topaloglu explained, "We're not sure how it happened—whether it existed before mankind or was the result of the Venus plans."

"But what is it?" Chazak listlessly insisted. He slumped in a womblike chair perpendicular to that of Topaloglu. Yes, he was privy, and intimate. He remembered his knife-edge posture of former years, the frazzling attention he had paid to nuance. It was easier now.

"The point is, we must keep the lid on while Prague reorganizes."

"How much time do we have?"

"Unknown. But it's essential that civilians—that is, tourists, emigrants and immigrants, and robot-laborers—do not suspect, though the disease story can get us into the same pickle if medication continues to prove ineffective."

"It is dangerous."

"Undoubtedly. But all the more so for us."

"The implications? For Terra, I mean."

"The only aspect of this you will be concerned with is the publicity. Until the election is over."

"What is the thing, then? Organic? Planetwide?"

Topaloglu's aspect remained a Hellenic profile. One golden iris glinted at Chazak.

"Surely there is a hypothesis," the historian pushed. "Can you walk the sword edge with us?"

Chazak eagerly straightened, "Tell me, You can trust me."

"There is a theory," he faced Chazak in full, "that a living organism, a system, and Venus are one. That we are like infectious microbes, or a toxic substance, that has invaded her body.

He stared at the lieutenant; he easily accepted this upon recalling what he had read in the purloined news sheet. "So I expected," he whispered

flatly.

"Until the election is over, our new prime minister and cabinet are installed, and a new policy is instituted, we must maintain security."

"But you know as well as I do that Venus is too

profitable, too strategic . . ."

Topaloglu guardedly examined his charge.

It was the proper amount of suspicion, Chazak understood. But his was a different passion. "I know," he said reassuringly. "There is no cure. For Venus it's either kill or be killed. But you can trust me.'

23

His room was empty. Hebe was gone. There were white rays issuing from the window panes overlooking his desk. Like impossible moonbeams, these spotlighted the ongoing manuscript that sat atop the desk. Chazak approached, gazed at the handwriting on the sheaf of plaspape. Why had he started a history of Venus in the first place, he wondered. To prop up a sagging capacity for self-discipline?

To protest his diligence even on a world of leisure? To establish his proprietorship over the planet by grabbing well-known facts, restating them, stamping his name on them....

"What else is there to say to you," he asked aloud, haughtily taunting the white light that coiled

into angry twisters of fire as he stared.

She pleaded, sparked memories of helpless, dying creatures that had once torn his heart. "Did you call me from my Amarnan intentions, hoping that I would save you? Did you read the thoughts of countless humans? Was I a myth? I'm human, like them. You shouldn't have expected so much from a human."

Tiberius and Gaius, the Gracchi, pressed to the fore of his conscious mind. They stood in an attitude of condemnation. "You still have the strength," they argued. "No," he shouted. "How were you rewarded? I don't want to die."

"If you fear death, leave now armed with what you know, Save this world." Seneca demanded.

"I'm doing my polis and Republic a service," he replied. "Venus is only a victim of the decay, just as you were, I want to enjoy the cream of life instead of the curd."

## 24

Captain Arghezi was his guide. They toured dometopped Jamka Tábor. Chazak was permitted to see enough to flatter him, to convince him of government sincerity.

The return flight from the western hemisphere's equatorial army camp to Kithira afforded Captain Arghezi an opportunity to broach the crucial subject.

Chazak peered out the tinted port beside him

and watched the denser, larger surface ulcers on the Venusian surface kilometers below. Clouds with brown-red, fraying edges floated like necrotic epidermal flaps closer and closer to the tiny, hurtling four-passenger Scout.

"... therefore," Arghezi piloted and spoke cheerfully. "we were hoping you could be prevailed

upon ...'

"I offered my help."

"... prevailed upon to write a piece, a short article, assuring our inhabited corner of the galaxy that Venus is safe and healthy. The citizens trust you."

"Yes, I can do that."

"You will be rewarded, of course. Anything you want. Name your desire and we will provide. What's your choice?"

He saw Smolenov as he had seen him last, hurrying by in his mind's eye. What they gave they apparently could take away.

"If this misfires, you will be taken off-planet

with the rest of us."

And the body politic left to the Venusian revenge. How far would that reach?

"We need your invaluable assistance, friend. Only you can give us an unassailable stamp of approval."

This was a dying planet; here was an agony no human could comprehend, Chazak weighed. Then he dammed the emotion: he made his decision.

### 25

The skeleton of the opus existed. His incomplete history of Venus would form the framework of the new Chazak. "I'm doing my duty," he contended. He sat like a stone, correct in the chair, his pen a gelding's phallus.

The Forum Romanum was a hive of activity. People waited, he with them before the Curia. If any of the ancient stock, the noble breed, the patricians of mind and spirit remained flaming after the civil wars, Octavian had snuffed them. One was left, an anachronistic stoic who could oppose this naming of Augustus, this subtle shift and consolidation of power. The people cried Pax Romana; they wanted no reminders of honor, of gravitas, of their heroic struggle against Tarquin. The republic was saved, Augustus proclaimed. He was called princeps and who dared protest?

Chazak blasted the vision, scattering gnawing guilt. "... declared a moratorium on investigations by civilian independents," he reread. He shook his head. "Which was the pragmatic, wise thing to

do," he wrote.

#### 26

Chazak could not avoid his reflection. It hounded him. In the mirrors, hundreds of mirrors that duplicated every move, he saw an old, very old and tired man—a face clawed by conscience, the patrician cut gone pallid, squint-eyed, crack-lipped. He wanted no reminders. "We can do anything," he heard the cosmetician brag.

He was squestered in a mirror-plated cube. He undressed. His operator, different from though identical to the last one, made him ready. Arranged on shelves were liquids, powders, thits, creams, acids. Attached to one wall was a folded cybernetic bat wing, its flexible fingers dangling from the metallic radius and ulna.

Chazak saw himself for the first and last time. He gagged.

"Monsieur, are you feeling well enough?" the

male asked while whipping a white, chlorinesmelling cloth and laying it like a pall over Chazak's naked body. The chair was leveled.

He opened his eyes to infinite selves—frightened, saucer-eyed corpses in the ceiling. "It's the air," he

gasped.

"Yes, it has been rather bad lately."

In hours, no hypocrisy. He would match what he was. He could not return after this. He didn't want to. He shut himself in with visions of the yellow life—hedonistic freedom, everywhere he turned more and more freedom and less and less responsibility.

Eyes lost dullness, brows became iron black, and the facial flesh firmed. They—she—wept. Tacitus and Seneca, or the figures she had conjured

for him.

"Innocent like a child," the cosmetician was blathering in the distance. "That nose is just too stern. A little turn, like so."

His hair was rich ebony, soft jet in youthful abundance. His muscles were tightened, his skin

stained tan to signify vitality, extroversion.

Coriolanus' family was kneeling, begging for compassion. Chazak felt the sting of injections, the heat of radiant energy. Adrenaline shot through his arteries. The inevitable clock of his pulse boomed in his ears. Anticipation coursed, prickling like electricity. In pain, she withdrew.

He steeled himself, raised his lids. His Prometheus was standing with hands clasped, gloating over the finished product. The chair came suddenly upright and Chazak saw what he hoped he would

see.

"Your treatment is guaranteed for an Earth year. You will need periodic examinations to prevent regression. You can expect to visit us quite often."

The 26-year-old pranced frenetically from dacha to dacha. The top whirled from hermetic hotel to conditioned car to tomb-tight home while a powerful, pungent, sibilant wind drove life from the Kithiran streets. Night was now measured in hours.

"Friend Carak." General Gorazd drew him aside.

"Can I speak with you, over here," he pointed with

the glass in his hand. Ice circlets chinked.

They huddled in a corner of the general's crowded living room. Chazak did not like to pause. By his own rites he would dance himself to death. "I must meet more of your friends," he spouted drunkenly. "You haven't let me. I know you re keeping me in the cooler. I'm Josef Emil Chazak."

"We are in awe of you, truly. My friend, there have been more deaths. Much sickness. It's becom-

ing difficult to keep this under control."

"You're toying with me. I'm your puppet—just a sykou're toying with me. I'm your puppet—just a sykou're for the was mumbling, not thinking. The alcohol, Genran weed, tablet stimulants plucked at seriousness, cajoling the residual dour to sing and play, to forget.

"Non-Praguer poleis, nonaligned Venusian colonies are also apprehensive. We must prevent a public outcry. With luck, the families of the de-

ceased can be-"

"Won't last forever. It's either kill or be killed."
"Do this for the Republic. Go to the hotels, the inns, the flats, the hospitals, the offices. Persuade your contacts that everything is in order. If this works, you will be sent to the Lagan colonies.

They've expressed an interest in you. The Africans respect you."

"Everyone respects me," he slurred, threw up an arm. "Can I have that one tonight?" He bluntly

indicated a woman with short, platinum hair. She had been obliquely eyeing him, he was sure. "Who?" he winced. "But will you do this?"

"To save is to betray and to betray is to save."

He lost sight of her, was momentarily flustered.
"That one, there."

"Good. You'll start as soon as possible, We haven't

much time." He lifted one side of his mouth. "You'll find our gratitude in your room tonight. I'm sure you won't be displeased."

### 28

Bloody fireworks, stars of flame fell smoking. Cinders flared above terrified, running forms, unmasking in green what should be blue, in orange what should be red. The lights of streets, docks, cars, boats, and buildings shone a dirty ocher. Chazak reeled along the Adonis Canal. Mount Ida was an open sore at the far edge of his sight. Craft like flies landed and soared. He could guess who was being evacuated and who was not.

Clouds mounted one another, mighty pus-colored anvils that sent sparks showering. The surface reeked of sulfur. It seemed the very molecules were scorched. "Don't panle, this will be corrected," Chazak shouted at a mob that rushed by with death-mask faces. Shades flitted from the corner of his eye. Wraiths scattered into nothingness. He

too began to run.

Where were his friends? He had done as they asked. Where were his rescuers? His heart and head hammered. He slowed to a stumble, started in several directions like a creature at bay.

The canal banks gave way. The Adonis' liquid contents folded, seethed like cooking tar, and climbed. Attacking tongues of pitchlike froth over-

flowed onto the docks. Gondolas were twirled. crushed, swallowed. The park animals' frenzied and fearful screams gave rise to wails of terror. Chazak watched the reverted water toe at his feet like lava. He was paralyzed. Then suddenly a path was cleared.

He felt his limbs grow cold. "I can't do anything for you," he cried to the howl of rage and pain. His body was seared as if he sweated acid. Nasal cartilage, scalp, undereyes erupted. The youth was rupturing. The precarious joinings were disintegrating. A low-browed, hairy ancient male within cackled and crowed. He was beast to beast, being to being.

Through gashes in the stampeding cloud mountains he saw his Earth, a ghastly yellow. Then Terra Mater was engulfed, his last view of her torn from his eyes. Convulsions shocked the ground, fracturing the crust, splintering what had been built by men. Chazak swayed, ringed by a thickening vortex.

She was Medea, Clytemnestra, Agave, but she offered him one more chance. "Save us," she whispered, "You must take one final stand," Salt water tracked his face. He would never see

them again, never again be in the company of Lucretius or Cicero. The new Chazak trumpeted. "They'll find me, they'll take me away. I'll have anything, everything." The idea unfolded: prime minister. It was his due. He would rule.

"You will rule," she repeated like the slash of a

crystal blade.

In the deep near-day her path radiated whitegold. It thrust through the dark, roiling tide; a nexus of scintillations. Like the walls of a transparent tunnel, the spangled sides refracted the wreckage of the city. From within, Chazak saw the highlighted planes of the twisted, toppled landscape. The bodies of people, plants and animals, slabs of stone formed a melange suspended at a moment of death.

Chazak was joyous. I'm saved, he thought. They've come for me. She marched ahead of him. Pearl, ivory, and platinum, the beautiful goddess herself showed him the way to greatness. He followed her

through unseeing stares.

They were joined by others. Unidentifiable humanoids, as pale as the planet, leaped and jigged, kicked and cantered in silence. It was a pantomime of glory. He was brought to the steps of a building. He ascended and entered.

29

Men and women scurried with briefcases and suitcases. The room was mutter-filled. The security shield sizzled at the ceiling junctures, threatening to short circuit as soundless explosions sent tremors into the soles of those assembled.

Albert Janda and the government aides lifted gawking faces as the ragged man entered, Janda's hairline dribbled perspiration. His handsome Nordic face was wax-like, his neck stippled with red. He waved the adjutants to stand behind him, and stepped forward. There were several snaps, light wavered. Brown, then blackneed ink-blot patterns formed on the upper walls, spread downward. The stench of burning plastic herded the underlings into a school of fish. They cringed in unison as Chazak approached. Janda maintained his vantage. He held up a hand—in greeting, or did the two fingers, the bend of the thumb indicate something else? "We've been looking for you. Where have you been? It's time to go."

"General Gorazd asked me-but it's too late. I'm

here now. We can win the game." His bones angled unnaturally under the parchment skin. His scrabbly hair dangled in clumps. His mouth screwed into a grotesque smile.

Janda had been buzzing words into another official's ear. He returned to Josef Emil Chazak, Obligation, concern seemed evident. "Yes. With you in our train, we can win. We will return to Earth

together.'

Janda's form and those of his attendants grew big-bellied, then shrank to globules like reflections in a carnival mirror. The taut string fluttered until Chazak found his anchor in a place he knew.

The pearlescent marble of Latium bathed the chamber in a vaporous sheen. Outside, the raucous plebians summoned forth their princeps. Janda's silver bangs, his purple hemmed toga, his raised fingers casting a shadow against his tranquil face, bespoke the Julians; descended from Venus, it was said. Around him, in senators' robes, were those with whom he would take the reins.

"I was to be the one," Chazak complained. "Did you know, Cicero was murdered. His dead tongue is pierced."

Chazak inspected his own garment. No Tyrian border marked him. His head shot up, "This isn't

right. I'm to be the next . . .

"King, here, of course. Perhaps it would be best if you stayed. You will have the throne on Venus. Your subjects await you." Janda's alabaster inner arms spread wide. "I appoint you their Caesar." He and his train trod with dignity into a cloudy exit.

Chazak emerged.

He was triumphantly erected. The cavorting males, females, and others of the galaxy's races lifted and carried him on their shoulders, Cymbals and horns, drums and rattles, pipes and staves brandishing the imperial eagle accompanied the silent mob.

In the Kithiran dawn the unclothed glowing figures gamboled over the upheaval's rubble. A winding down, a deceleration; then crimson eyes all turned to him as he was deposited on the steps of the Temple of Venus. "My friends;" he shouted. The rattles shook. A tide of incandescent mist crept from the horizon. "Caesar speaks in Rome. A new power owns the worlds." The red dot eyes at the farthest edges of the crowd winked out. An ocean of white rose between the feet and legs of the audience beneath him. Thousands of forearms crossed over thousands of rib-ridged chests. The Goddess pulled her veil: the ruby, unblinking stares disappeared pair by pair. From a host of celipsed throats the holloa went out, "We two go together."

#### 30

Prime Minister Albert Janda delivered the funeral oration. In it he praised an incorruptible man. "How ironic," he lamented, "that the same virus which felled Komensky also took his implacable foe."

Josef Emil Chazak's withered body, painted and preserved in its glass box, was ceremoniously interred within a vault beside those of Komensky and Belisarius, in a palisade of the Hrad. The galaxy mourned. The last thorn was dead.

## EDITOR'S INTRODUCTION TO:

# **RIGHT-ANGLE REALITIES**

by John Gribbin

On the other hand, Dr. John Gribbin tells us that all that could be not only may be, but is. Perhaps we can have the wolf, even though only at the suffrance of logicians.

I have recently finished reading Dr. Gribbin's In Search of Schrödinger's Cat; it is a book easily read, but not so easily forgotten.

# RIGHT-ANGLE REALITIES

# John Gribbin

The idea of parallel worlds—alternate realities where history developed along different lines—is one of the most familiar, tried and tested devices in science fiction. Many SF stories are set in so-called "parallel" realities, where the South won the American Civil War, or the Spanish Armada succeeded in conquering England, and so on. Some describe the adventures of a hero who travels sideways through time from one alternative reality to another; a few describe, with suitable gobbledy-gook language, how such an alternate world may split off from our own time track. Well, I've got some good news and some bad news for fans of stories set in alternate realities.

The good news is that the best modern understanding of physics, quantum physics, says that such worlds really might exist. The bad news is that they don't exist "parallel" to our reality, and you can't get to them by slipping sideways through time. And the mixed news is that if anyone ever succeeds in constructing a working time machine of the conventional kind that runs backwards and forward along the track of our own reality, then it just might turn out to be a machine that takes you into those alternate realities as well. The reason for all this is that what quantum physics tells us is that the alternate worlds lie, not parallel to our own, but at right angles in time. Every alternate reality is perpendicular to every other, with a separate dimension of time required for each reality.

This new understanding of reality emerged during the 1920s and 1930s, after physicists discovered that in order to explain the way electrons behave in atoms, and how atoms combine with one another to make molecules, they had to use a description of the electron as a wave, not as a tiny, hard billiard ball. Subatomic particles, and atoms themselves to a lesser extent, behave both as particles and waves. In the same way, light, which we usually think of as an electromagnetic wave, can also be described in terms of particles, called photons. This discovery pulled the rug from under the edifice of physics that had been painstakingly constructed over the centuries since Isaac Newton's day, and led to the construction of a new edifice, the theory of quantum physics. You don't have to worry too much about quantum physics in everyday life because the rules of the quantum game apply only to things the size of atoms or smaller. Newton's laws work perfectly well on the human scale of things. On the other hand, everything we see and touch and feel is made of those subatomic particles. So surely, in some way, the quantum rules that govern their behavior must influence the everyday world.

Physicists and philosophers have been arguing

this point now for 60 years. Erwin Schrödinger, the Austrian physicist who introduced the wave equation description of the electron into physics. became so horrified at what this led to that he later said, "I don't like it, and I wish I never had anything to do with it." Albert Einstein, another pioneer of the dual description of nature (it was he who proved that light behaves like particles, not waves, under certain conditions), also rejected the whole basis of quantum physics in later life. His objection was the same as Schrödinger's-neither of them could accept the interpretation of these particle waves in terms of probabilities, the interpretation that led directly to all the great successes of modern science (the atom bomb, the understanding of the DNA molecule, lasers, solid state computers, and the rest), "I cannot believe," Einstein said of the probability interpretation of quantum physics, "that God plays dice with the Universe.

Lesser physicists simply followed the rules laid down by the pioneers, and used the probability interpretation to probe the mysteries of the Universe. Their success suggests that Einstein was wrong; God does play dice with the Universe. And that is where the alternate realities, the perpendic-

ular, not parallel, worlds of SF, come in.

I don't have space here to go into the details of the quantum revolution. If you are interested, you can find them in my book. In Search of Schrödinge's Cat, published by Bantam. The reason I gave my book this bizarre title is that the so-called "paradox" of Schrödinger's cat lies at the heart of the probability interpretation, the puzzle that led both Einstein and Schrödinger to reject the theory they helped to bring into the world.

Schrödinger's cat is a mythical beast. It owes its

existence (or nonexistence) to those waves of probability that come into quantum physics. They work like this. If we make a measurement that locates the position of an electron, say, then we know where the electron is at the instant we make the measurement. The act of making the measurement reveals the electron as a particle. But what happens as soon as we stop looking at it? Then, according to the same theory of physics that explains how your digital wristwatch works, the electron promptly stops behaving like a particle and starts spreading out like a wave. The wave spreads more strongly in some directions than in others, but in theory, its influence extends everywhere. So what happens the next time we measure the position of the electron? As we make the measurement, quantum physics says, the wave collapses back into a definite particle. It could turn back into a particle anywhere in the volume of space the wave has spread through, but it is most likely to show up as a particle in the region where the wave is strongest. So the wave is called a "probability wave".

It all sounds like Alice in Wonderland—nothing is real except when you are looking at it; particles turn into waves and spread through the Universe as soon as your back is turned; you can never calculate definitely where an electron or some other particle will be, only the probability of finding it in a certain place. No wonder Einstein refused to accept it. The strange thing is that this Alice-in-Wonderland theory allows us to explain how all molecules, including the life molecule DNA, are put together. And without the probability interpretation of quantum physics, there is no way of explaining how lasers work. So what does it tell us about mythical cats?

The probability rules also govern the behavior of

radioactivity. We can calculate the probability that a radioactive atom will decay-turn into a stable atom—during a certain time interval, but there is no certainty. Any individual atom may decay now. or tomorrow, or 10 years from next Thursday, whatever the probability rules may say. Yet, when very many atoms are put together, the probability rules work impeccably. For a particular radioactive substance, exactly half of the atoms there to start with will decay in a certain time, called the half life. Half the rest will decay during the same interval of time, leaving one quarter of the original sample. And it takes exactly the same half life for half of that quarter to decay-and so on. It doesn't matter if you start with 10,000 atoms, or 10 million, or 10 billion. Half of them will decay during the half life, but there is no way of predicting in advance which individual atoms will decay and which ones will remain.

So, mused Schrödinger, in principle we could set up an amusing little experiment. We could set up a closed box in which there is a sample of radioactive material and a geiger counter to measure the radiation from it. We can choose the sample in such a way that there is an exactly 50-50 chance that the counter will monitor a certain kind of radioactive decay during some chosen time interval, perhaps a day. And we can arrange that if the counter does measure radiation, then an automatic mechanism floods the box with lethal poison. Now, imagine such a box set up, with a live cat placed in it, and closed for the required time interval. What is inside the box when just enough time has gone by so that there is exactly a 50-50 chance that the geiger counter has monitored a radioactive decay?

Common sense tells us that either there has been

a decay, and the cat has been poisoned, or there has not been a decay, and the cat is alive. But quantum physics doesn't follow the rules of common sense. Just like an electron spreading out to fill the Universe when we aren't looking at it, the rules of quantum physics say that all of the possible probability states inside the box co-exist until we look inside and collapse the wave function. In the case of the electron, when we look, the wave collapses into a single electron at a definite place. In the case of the cat in the box, the experiment is designed so that there are only two probabilities to choose from, and it is only when we look that the choice of probabilities collapses into one or the other state, and we find the cat to be either alive or dead. When we aren't looking, the cat is neither dead nor alive (or, if you prefer, it is both dead and alive at the same time).

Schrödinger set up this imaginary paradox to show that the probability rules are so absurd that they must be wrong. Unfortunately, for the past 50 years, every test has shown that the probability rules are right. So what does happen to Schröd-

inger's cat?

Most physicists simply ignore the question. What goes on inside a closed box when you aren't looking at it doesn't matter to them as long as you have a set of rules you can use to design lasers, or whatever. The philosophers still debate the point, but not, usually, with any feeling that it has any practical bearing on reality. But since the 1950s there has been another interpretation of the cat-in-the-box paradox, an interpretation that retains all the practical benefits of quantum physics, does away with cats that are neither alive nor dead, and opens up the prospect of alternate realities. For once, though, the physicists were about 20

years behind the science fiction writers in coming up with the idea.

The earliest version of a properly worked out parallel realities story that I have been able to trace is Jack Williamson's The Legion of Time, first published as a magazine serial in 1938. Williamson had clearly been doing his homework on the new theories of the 1930s, as the words he puts in the mouth of one of his characters show!

"With the substitution of waves of probability for concrete particles, the world lines of objects are no longer the fixed and simple paths they once were. Geodesics have an infinite proliferation of possible branches, at the

whim of subatomic determinism."

Williamson's idea, passed on to generations of SF writers, is that every time reality is faced with a "choice" at the quantum level, like the choice that leads to the cat in the box being either alive or dead, reality itself splits into two or more paths, with every possibility being realized in one of the time tracks. Hence the idea of parallel worlds, branching out from some crucial nexus point in history and running alongside each other through some multidimensional continuum. I bet vou never realized, when you read Harry Harrison's "A Trans-atlantic Tunnel, Hurrah," that it was based on sound science! But Williamson's version is still a world of ghost realities, in which the heroic action takes place, with all but one of the realities-all but one of the probability waves-collapsing and disappearing when a crucial decision is made and one world. like the electron when it is looked at. becomes concrete reality.

In the 1950s, real physics, not SF, gave us something better-a version of quantum physics in which

every probability world is equally real.

The idea came from Hugh Everett, a graduate student at Princeton University. And it can be explained simply in terms of Schrödinger's cat. What Everett said, in effect, was that reality—the entire universe—divides when faced with a choice like the cat-in-the-box experiment. In one branch of reality, the cat lives; in the other, it dies. There is no "half-dead" cat, and no paradox. It's just that we can only be aware of one reality and therefore only see one of the outcomes. But somewhere (or somewhere) else there is another me, and another

you, viewing the alternate reality.

Extend that idea to every choice of quantum possibilities that has ever, or will ever, happen, and you have some idea of the complexity of Everett's "many worlds" interpretation of quantum physics, and of why most physicists balk at it. And vet, as Everett explained more than 25 years ago, it is a logical, self-consistent description of quantum reality that conflicts with no experimental or observational evidence. It makes exactly the same predictions as the conventional interpretation does about lasers, digital watches, and so on, Indeed, those physicists who bother to notice the idea at all today tend to dismiss it on those grounds. For all practical purposes, they say, the many worlds theory is the same as the probability interpretation, and we already have the probability interpretation, so we don't need the many worlds theory. I wonder if they would have applied the same logic if the many worlds theory had come along first, with the probability interpretation as the afterthought. In both cases, the theory predicts that our experience of reality will be exactly what it in fact is. And I for one prefer the idea of there being many different real worlds, only one of which I happen to be able to see, rather than that there are myriads of ghost realities, which coalesce into one real world when I look at it but dissolve into unreality when I happen to be looking the other way!

So there is nothing in physics that savs that the reality we know is the only reality. The snag is finding a way to communicate with the other worlds. The math says that each branch that occurs when the world (or worlds) is faced with a quantum choice is at right angles to every other branch in the time stream. That needs a lot of dimensions, but why should that worry us? The fact that we are only aware of three dimensions of space and one of time is no reason to believe that four dimensions are all that there are. On the favorite SF picture of parallel worlds, all are running forward side by side like cars on a multilane highway. Moving from one to the other would involve traveling at right angles to the normal flow of time, like jumping from one car to the one alongside. But if every time "highway" is at right angles to every other, how could you get from our reality to a different one? There is no "next door" to jump to, and moving at right angles to our time flow simply creates a new reality.

The answer is simple. You have to move backwards in time down our own time stream until you get to the crucial junction point where the branch of history you are interested in split off. Then, you can move "forward" at right angles fore of the right angles) to the reality you started out in, entering a different branch of history. Of course, there are snags. The first problem is deciding how you select a branch of reality to travel along. After all, quantum physics says that there is an almost infinite number of possible futures branching out, all at right angles to each other, from the here and now. And you can apply the same kind of argu-

ment in reverse. There must be an almost infinite number of alternate past realities, converging on the here and now. There are many different ways in which the world as we know it could have got to be the way it is, and there may be no unique past, just as there is no unique future. An intrepid would-be time traveler who fails to take that into account might find that when he stepped into his time machine and pressed the button for 2 million B.C. he got disassembled into his constituent molecules and shared out amongst a vast array of

different versions of 2 million B.C.!

But if that difficulty can be solved, traveling among alternate realities might be the least of your problems. Go back a few years down one branch of history, and you'd need some pretty sophisticated machinery to retrace your path back to where you started from. It might be easy enough to get it roughly right, but could you ever be sure that the world you returned to wasn't subtly different from the one you started from? That there wasn't a slight difference in history-nothing as major as the South winning the Civil War, but perhaps the odd cat being dead instead of alive? How would you pick out one thread of reality from the whole cloth? Perhaps it's just as well that conventional linear time travel, what you might call time travel of the first kind, is impossible. Or is it? I know a man, a respected and respectable mathematician holding down a senior post in an American university, who says that he can design a working time machine. But that is another storyone I'll return to on another occasion. Meanwhile. ponder on the many worlds interpretation of quantum physics. Every time you are faced with a decision (Shall I wear the red tie today or the blue one? Shall I go to work or stay in bed?) every possibility becomes a reality of its own, splitting history into a million shards, threads stretching out at right angles to each other through superspace and supertime. Some versions of history are more probable than others, so maybe those threads are thicker and easier to travel along. But, says quantum physics, all are real.

There ought to be a way to make use of this, and there is, if you really believe it. Buy a lottery ticket. If you win a million bucks, well and good, live it up a little. If you don't win, what the hell-shoot yourself. After all, you would only be eliminating one of the versions of your personal history in which you fail to become a millionaire. Somewhere, in some alternate reality, you are in a position to fulfill all your wildest dreams. The logic is impeccable, but you have to have real faith in the theory to take it to its logical conclusion. Could anyone have such faith in a scientific theory? Maybe, I've written a couple of stories built around this theme: watch out for them, if you inhabit a reality where I've persuaded some editor to publish them.

### **EDITOR'S INTRODUCTION TO:**

## A WINK IN THE EYE OF THE WOLF

by

Alexander Jablokov

We don't often include fantasy in these pages because most fantasy doesn't fit in a magazine built largely around logic and hard science. Sometimes, though, we find a story with rivets. Larry Niven couldn't have done better than this.

Logic doth make fools of reasonable men, Surely there's a remedy for that?

# A WINK IN THE EYE OF THE WOLF

## Alexander lablokov

The thunder of the door knocker echoed among the rocks that guarded the approach to the Malachite Tower, though the oak door itself seemed not to resonate at all. Llobportis gathered his scarlet cloak about himself, pulled his helmet down as far over his ears as possible, and listened to the echo continue, rebounding off the carefully angled rock faces, enjoying itself like a porpoise in the harbor. The sound of the door knocker finally roared back at him, increased a thousandfold. The ground shook and the stone steps beneath his feet shattered. This display of wizardly power never failed to irritate him, an honest policeman about his business.

The door knocker twisted in his hand. "Who calls upon the Master?" a voice bellowed. The door became a blazing face, popeyed, snakes writhing on cheeks and forehead, and nose that of a wild

boar, "Unhand my nose!"

Llobportis released the offended member. "I'm here to see—"

"The Master is home to no one! His mighty

labors-

"Shut up!" Llobportis screamed, already feeling his voice going hoarse, a serious tactical error. "Do we have to go through this every time?"

"My duty is sacred," the face said, with a mammoth sneer. "I do not permit thy insignificance to

disturb it."

"Did you know that portal guardians fall under

the jurisdiction of the Ministry of Magical Affairs, of which I am an officer of no mean rank?"

The face raised its nose disdainfully, an impressive sight. "The petty hierarchies of men concern me not. Begone! The Master will not be bothered with gnats buzzing in his ear."

"Do you want this neighborhood rezoned for dryads, water sprites, and singing flowers? You'd be talking out of the other end of your face then, wouldn't you, putting garlands in your hair and trying to whistle like a lark! Now, tell your master

I'm here, or-"

The face opened its mouth to bellow a retort but, with a look of annoyance, continued to open it, wider and wider, until the face was gone and the front door of the Malachite Tower stood open. A burly, bearded man with a pink scalp and busly white eyebrows stood just within, wearing a leather apron and wiping his hands on a rag.

"Djeenek!" Llobportis said. "Greetings."

"Greetings," Djeenek the Prismatic, Master of the Malachite Tower said, somewhat sourly. They clasped shoulders. He gestured the other to enter, shaking his head. "It is no wonder that prisoners of the police complain of ill treatment. If a simpleminded portal guardian can drive you into such a fit of irritation, an honest thief must cause all-

consuming rage.

They climbed the stairway that spiraled up within the tower, their way lit by glowing crystal spheres that rested in wall niches. The spheres gave enough light to reveal their own beauty, but not enough to illuminate the stairs, their ostensible purpose. Llobportis tripped, started to curse, and caught himself. "It's just that sometimes they seem so unreasonable-"What do you mean by that?" Djeenek asked,

with unexpected sharpness.

"What?" Llobportis sounded aggrieved, his feeble apology having been ignored. "Don't take it so personally, for the Mage's sake. You told me it wasn't meant to be reasonable. Something about scaring away tradesmen, although I'm sure none of them wait past the first sound of the door knocker ... can we get upstairs? At the Academy, we learned the characteristics of the favored environments of footpads and necromancers. These slimy stairs could serve as a good textbook example, and they give me the creeps.

Dieenek chuckled, and resumed the ascent. "Forgive me, old friend. I misunderstood your sense.

"You'll not be the first. What's wrong?" "Rumors- from Africa and farther east. A fool-

ish thing, to mind rumors, perhaps, but these are such that trouble a magician's sleep. Of men bent on the destruction of magic, of unnatural devices, of those who search beneath the Mage's cloak and find it hollow ...

"Sounds rather vague."

"Rumors often are."

"Not in my experience. They usually come complete with all sorts of spurious details-names, dates, places, verbatim quotations, and the like.

I'm surprised that you haven't heard what these mysterious destroyers of magic wear. That, for some reason, is a popular detail.

"Robes of brown linen," Djeenek said, with a

raised eyebrow. "And they carry staffs."

"See? That makes everything so much more believable."

They emerged into Dieenek's apartments. The room seemed, at first glance, to be a mad tangle of machinery, glassware, and manuscripts, but, on further examination, remained a mad tangle of machinery, glassware, and manuscripts. There was no apparent order to the bronze griffon's heads, lapis lazuli amulets, alembics with congealed pools of dull metal in their bottoms, tiger's eggs, orreries, and illuminated texts from the distant Hyrcanian shore. There was no hidden order, either; each lay where Dieenek had last used it.

In the middle of the room, the massive leatherbound codex of the Handbook of Transformational Constants open on a stand next to it, was a table holding some sort of diorama. Llobportis bent to examine it more closely. The surface of the table was coated with dry, yellowish dust, like that occasionally deposited on the city by a windstorm from deep in the continental interior. In the center of the table were inset two brass bowls, one higher than the other, the lower filled with water, verdant islands floating in it like emeralds inset in polished metal. Around these pools were earthen walled huts typical of those inhabited by the peasants of the Central Plain, and a number of the peasants themselves, some engaged in activities such as rethatching a roof or sharpening a tool, but most standing around in typical peasant attitudes, not doing much of anything but ready to spring into action at the approach of an overseer.

"This is new, Djeenek. What is it?"

"A failure" the magician said. He rolled an armillary sphere off a chair onto a folded hippopotamus hide and sat. "I wish to persuade water to flow uphil, something it persistently and perversely refuses to do. It seems to be seeking something, call it its natural place, if you will, deep within the earth. Perhaps the Mother Ocean lies there, eternally calling her children to return to her from their exile. Perhaps water fears the eye of the sun, and seeks to hide within the rocks. Perhaps it simply enjoys the downward movement, much the way children enjoy jumping off a high place into a pile of hay."

"Why don't you just let it do what it wants,

then? Why be a spoilsport?"

"Famine stalks the Central Plains. It comes not unbidden: its path has been laid out by the drought of these last three years. The fields are dry, but there is yet water in the rivers. It must be raised from the streambed to the level of the fields."

"It doesn't sound too serious. Why don't you just call up a rain? They do it all the time in the African mountains, near the Pillars of Herakles."

Dieenek shook his head. "When the Mage rolled the waters of the sea from this land, he made his law: none shall ever bring the sea back over the land. If I raise clouds from the ocean to bring rain to the Central Plain, I will violate this edict, and my soul be forfeit. Only the Mage himself, should he tire of his creation, could dare the act."

"So---

"So I politic, and connive, and flatter Haran the Refulgent, pompous ass that he is, and threaten Rodobar the Specular, whose only saving grace is shame at his transgressions, and convince the whole assemblage of blunt heads of the Sacred Consistory to allow me to open a portal of power here, on the Street of Magicians, an area so riddled with extrusions of magic that it threatens to dissolve into primal chaos and sweat blood, which has ruined three good robes already, and calculate, and sacrifice, and I am unable to get even so much as an ant's piss stream of water to go up that incline!" He got up and began rooting about in a corner filled with narwhal tusks, Irish elk antlers, and assorted unidentifiable bones.

Llobportis sat down in the chair the magician had vacated, not daring to shift anything to make himself a seat anywhere else. "If we're done with this dull business of mass famine, I have a real

problem for you.

Djeenek, intent on his search, was only half listening. "The penis bone of a walrus—ridiculous conception to begin with. The skull of a mountain hyrax—none too clean, and the wrong species, to boot. Aha!" From the farthest corner he pulled a dusty amphora. "Behold. Wine."

"Indeed?"

"In conception, and in deed. I was certain some remained." A sudden worry furrowed his brow. "Or is it that glass etching fluid I have been searching for?" He peered at the seal. "Claims to be a fine vintage. From Kôs, no less. Well, seals have been known to lie." He produced two cups and filled them. "I daresay we'll find out soon enough."

Llobportis accepted his cup gingerly, and it was not until he saw Djeenek take a sip of his own and smile that he drained it. He poured himself another.

"Problem. You indicated that you had a problem. Cease guzzling that most excellent wine as if it were swill from the corner tavern and speak."

The policeman wiped his mouth with the back

of his hand. "There's a house on the Street of Anonymous Assignations whose display has died." He gulped at his cup.

"Yes?" Dieenek prompted. "And the resulting darkness permitted a brutal ritual sacrifice to be consummated, opening a gate of black power?" "No."

"The flames of the display have coalesced into a fire elemental that even now roams the Pleasure Quarter, consuming virgins? It must be mad with hunger by this time."

"Not really."

"The girls of the house, darkness weighing on their souls, have lacerated their breasts with their fingernails and are assaulting surrounding establishments in search of men to punish for their degradation?"

I hadn't heard anything."

"Then what in the seven times seven sacred names of the Mage is happening that should concern us?"

"The lady of the house, an old biddy name of Ragana, has lodged a beef with the Municipal Prefect, saving we've got to help her out."

"Yes?"

"Well, she's got something on the Prefect, or he owes her a favor, or she's his mother, or something, but he's leaning on me to take care of it." "And?"

"And nothing! That's it! Someone's put a curse on the light display that brings customers into her house and it's gone out and no one can light it again and the Prefect's breathing down my neck. What more do you want?"

"Hymenophagic salamanders?"

"Sorry, out of stock."

Dieenek walked over and looked out his win-

dow. The Malachite Tower stood at the highest point of that ridge that carried the Street of Magicians on its spine. The houses of the magicians were spread out below, each a blank behind its whitewashed walls of coquina. The squares and corners of the street were filled with fountains and spouting sea serpents, sending glittering sprays into the sunlight. The magicians had brought forth this phantom water, which had not the power to nourish, but no one had concerned himself with its efficient disposal, so it spilled down the ridge, turning the formerly rich neighborhoods below into a dismal, malarial swamp, which now held a population of magical apprentices learning their trade. Occasionally, a flare and cloud of sulphurous smoke, followed by a choked-off scream, would testify to a final examination being failed. Beyond lay the tall warehouses of the waterfront and the curve of the harbor, blue and white in the sun. The rest of the city was a jumble of white blocks among the hills.

"A story is told, among magicians, that the Mage himself once rode in lightning bolt to the Western Islands, at the behest of a hungry Emperor, there to pick a red fruit which did not grow on a tree and was known, for some reason, as the Golden Apple. The Emperor chopped it up, put it in his salad with oil and vinegar, and ate it, finally saving that its flavor was fair, but he preferred radishes. There are two interpretations of this tale. The first is that all magicians, from the most powerful sorcerer down to the conjuror who changes water to wine at weddings, owe our respects and duties to the powers temporal, at whose sufferance we continue to exist and ply our trade."

"And the second?

"We are all at the mercy of fools." He sighed.

"Let me get my bag, and we will go. At least I won't have to sit here and stare at my irrigation table."

By the time they arrived at the Street of Anonymous Assignations, evening had fallen. They pushed their way through the crowd. High above the dark and clamorous mob rose the flaming eidolons of the houses of pleasure. A satyr pursued a maiden through a twisted wood. Disembodied male organs swam the sea like shoals of fish. Women coupled with unicorns, or with clouds. The glow of the displays touched the sweaty, eager faces of the men below, turning them to masks of lust. The two breasted the flood of men, Llobportis, eyes professionally sharp. Dieenek, aloofly contemptuous. The house of Ragana was not difficult to dis-

cover. It alone was silent. It alone was dark It alone was deserted, spurned by those who sought the night but feared its silence and its darkness. They knocked, and were permitted entrance by a slender, large-eved girl who showed them into the

courtvard and vanished.

Their eyes, adapted to the glare outside, were blind in the gloom of the courtvard. Somewhere toward the back of the house, voices were raised in anger.

'Give that back, you bitch!" "It's mine. You heard me. Mine!" "Not anymore, it isn't."

"Mine!"

"Will you shut up? You lost it at dice, fair and square. It's mine now!"

Tears and lamentations. A slap. Screams. Sounds of battle.

"Ah," Llobportis said. "In the midst of tragedy." life goes on.

Listening to the shrieks from upstairs, he advanced incautiously, and toppled, with the inevitability of tragedy, into an unseen pool of water. The silence following the splash was more elo-

quent than any oath.

A light appeared above, and bobbed downward. "Who the hell is sloshing around in the pool at this hour?" A woman appeared from the murk, vast and cruel like a cult object from some dark forest in Europe, a typical manager of a house in the Pleasure Quarter. Yards of silk draped her body, mercifully concealing more than revealing, and her hair was of a patently artificial orange. She touched the glowing sphere in her hand to a recess near the door and light sprang up around the oval courtyard and its colonnades, among which were scattered couches and low tables, now deserted. In the center was the pool, lined with mosaic, and Llobportis.

"That'll be five coppers for the bath, and an

extra copper for disturbing the clients."

"What clients?" Llobportis pulled himself from the pool, wringing his cloak and shaking the water from his helmet

"Ai! And clothed as well, ruffian. Five coppers for laundry, in addition. And an extra copper for service after sundown." She smiled suddenly, revealing bad teeth. "Now, what would you gents be wanting?" She patted her hair coquettishly.

"It's what you're wanting that we're here about," Llobportis said, with commendable patience. "I'm from the Ministry of Magical Affairs and—"

Ragana rolled her eyes. "Police! You're expecting something for free, aren't you? Well, forget it. Even the favors of the stable boy will cost you good cash; in advance, in your case."

Djeenek tapped his foot impatiently. "Madame.

Rest assured that your relentless rapacity has been adequately demonstrated. No further establishment of your bona fides shall be necessary." Storm clouds began to gather on Ragana's face. "As the Prefect said—"

"The Prefect!" she chirped, suddenly all smiles. "Why, the old duck, I knew he'd come through.

This is wonderful! I'll call the girls-'

"Please, Madame," Djeenek said, raising a hand.
"The work is delicate...." Llobportis looked disappointed.

She smiled mischievously, a horrendous sight. "I'll leave you two men to your business, then."

"Wait a minute," Llobportis protested.

Djeenek knelt and began removing equipment from his bag. "Magic is a clear, intellectual discipline."

pline."
Llobportis stepped backwards, after the retreating form of Ragana. "Policework, fortunately, is not." And Dieenek was alone with his task.

Rosy-fingered Aurora thrust her careworn thumb into the courtyard to find Djeenek sprawled dejectedly on a couch, the instruments of his trade scattered about like prizes in a children's game. Llobportis snorted vigorously on another couch, his arms flung around a pillar.

Sounds of another discussion carried from the

back of the house.

"You ungrateful slut. After all I've done for you!"
"What you've done? Aaaaah! Let go of my hair,
damn you, Ragana, let go! You've ruined me, that's
what you've done."

"Hah! That's a good one. Ruined you. That's like

polluting a public piss pot by spitting in it."

"Well, I'm leaving. There's no business here, and Morna's offered me a position."

"A position!" Ragana hooted, "And the customers always complaining that you didn't know enough of them.

"Leave me alone. My mind is firm."

"Firmer than those jugs of yours, cupcake. Morna won't be as forgiving as I am. Just wait. You'll find yourself doing monkey-climb-a-tree against a wall in a public alleyway for a copper a shot inside a month, see if you don't."
"That's not true!"

"Now, now, dear, don't cry. That's a good girl. Auntie Ragana will take care of you, like she always has. Don't you worry. I've got the brother of the Mage himself working on our problem, and he'll solve it in no time.

Ragana and her charge, a pale blonde with a red dripping nose and red teary eyes, appeared in the courtyard. Ragana's eye took in the situation

immediately.

"Is this what my years of friendship to the Prefect are worth?" she cried. "Is there no end to my suffering? I. an honest woman, a hard-working woman, who thought herself a friend to the Prefect, forced to rely on a policeman who bathes with his clothes on but takes full advantage of any free offer, and a doddering village spellcaster who couldn't remove a milkmaid's souring curse from a cow's udder."

Llobportis, unwilling to indulge in emotional exertions at that early hour, affected an interest in a piece of erotic mosaic. It showed an unnatural conjugation of men, women, satyrs, and domestic livestock among the trees and fields of an Arcadian landscape. He began at an arbitrary point and started to trace the chain to see where it led.

Dieenek arose from his couch with calm dignity. "Madame, I am Djeenek the Prismatic, Member of

#### A WINK IN THE EYE OF THE WOLF

the Sacred Consistory, Master of the Malachite Tower-not a village spellcaster." "Is the display fixed, then?"

"No. Madame, it is not," he said through clenched teeth "You keep us awake half the night with your

stinks and your chants, you charlatan, and all I get

in return is a recital of your credentials!" "They're all charla-charle-fakers, momma," the

blonde said, apparently resigning herself to her present condition of employment. "Just like that nasty Easterner in the brown robe said."

"That's telling them, dearie. Swindlers, the lot

of them."

Llobportis, having traced through the intricacies of the interlocking bodies back to his starting point, looked up. "What man?" His tone was gentle, but demanded an answer.

"The privacy of our customers is sacrosanct," Ragana said. "That information is available only on a paid fee basis. What sort of place do you

think this is?"

"A place that's rapidly going out of business." Ragana scowled, but gestured the girl to talk.

"He was a strange man, he was," she began tentatively, "He talked funny,"

"A speech impediment?"

"An accent. He was a foreigner. From another country, like. He wanted me to do the Scythian Plow with him-"

"What was his name?"

"Hard to say."

"Did he give you more than one name, or one that was obviously false?"

"No. It was hard to say, Gramma-Grammadurhu, I think, Grammadurhu of Taprobane. Then he wanted the Thracian Stallion-"

"Did he say what his business was?"

"Something to do with shrouds."

"He's an embalmer? Or a funeral choreographer?" "I don't think so . . . he said things were shrouded

in secrecy." "A priest?"

"An engineer, he said. Then he wanted to be the

Phrygian Shepherd-"An engineer? What the hell is an engineer?"

"Somebody who doesn't understand things very well, I guess. He said something like 'the activities of your engineers are shrouded in secrecy."

"I'll say. I've never even heard of them."

"Then he talked about our light display. He wanted me to do something called the Malabar Pilgrim, and I couldn't do it, and it hurt, and he got mad, and-"

"What did he say about the display?"

She began to blubber. "Is it my fault I can't stand on my head? Whoever heard of such a thing?" "What did he say?" Llobportis repeated.

"He said our display was impossible."

Ragana gasped in irritation. "I paid the finest light weaver in the city to design that display. Impossible, indeed!"

"He meant really impossible, I think. The light had no source. It was just coming from nowhere. That is impossible, isn't it?"
"You're an idiot," Ragana said.
"I am not! I may not be able to do the Malabar

Pilgrim, but I know a logical argument when I hear one."

"That's why you're an idiot, darling. He convinced you that our display was impossible when every house on this street has one?"

The girl looked doubtful, "Well . . . he was very convincing. He said he could work us up another one, the way they do it in Taprobane, using torches."

Djeenek, with a thoughtful expression, began to pack his equipment back into his bag.

"Did he say anything else?"

"He said he was going to take a walk down the Street of Smiths so he wouldn't be angry."

"Angry?" Llobportis said, all at sea.

"Yes. Something about keeping his temper ... because he was on edge. He was just mad because he tried to shave with his knife and some olive oil and ended up cutting himself."

"I don't think you got the point," Llobportis

muttered.
"Then he took his staff, and left."

Silently, intently, Djeenek gestured Llobportis to follow by jerking his head, and walked toward the door

"What are you doing?" Ragana demanded.

"I, Madame, am returning to my native village to remove some warts."

"What?" she shrieked. "Come back herel What about my display?" In sympathy with her mistress's anguish, the blonde began to cry. Djeenek said nothing, and allowed the door to close shut on Ragana's frantic, "Shut up. Shut up, damn you! The Prefect's going to hear about this, never fear." The resulting silence was blessed.

The Street of Anonymous Assignations was a night-blooming flower and looked, in the morning sun, as hungover as the two men washing themselves in the fountain on the corner, grunting and complaining to each other.

They walked down the street in silence for quite some time, Djeenek in a brown study, Llobportis jumping up and down with ill-concealed impa-

tience. He finally could stand it no longer. "What the hell is going on?"

Djeenek thought a moment. "Don't you find it strange?"

"Strange? That Djeenek the Prismatic, who sits on the right hand of the Mage and can shuffle the stars and planets in their spheres at will, can't remove a simple hex from a whorehouse's shop display? Darm right I find it strange. I've heard of magicians who've lost their powers but fear to show it, but I never thought..."

They paused at a fauit seller's where, silently, Djeenek purchased a melon. Splitting it in half with his sash knife, he handed part to Llobportis who, realizing that he had not had breakfast, lost no time in scooping out the seeds and tossing them to the ground. As they struck, they flashed in bright primary colors and made the sound of tinkling bells.

Liobportis dodged the flares. "Very impressive ail" The half melon he held suddenly grew sharp yellow teeth and swallowed his hand to the wrist. It pulsed, and began to swell, making the sound of a purring kitten. With a shriek, he smashed the carnivorous fruit against a wall. It exploded in a gout of juice and pulp, giggling insanely as it did so.

Checking his fingers to see that they were still attached to his hand, Llobportis stared at Djeenek in horror, entirely speechless.

"Never accuse a magician of having lost his power," Djeenek said in a flat, deadly tone. "Never. Even in jest, or as a matter of rhetoric. You strike at the heart of his existence." He passed a shaky hand across his brow. "Try to use your reason. The curse on that display is no simple hex. Far from it. It is one of the most impenetrable shadows of

magical suppression I have ever encountered." He sighed. "We are as the two friends in the tale who take two separate roads to flee from Death, only to find that in reality they are the same one, the one that leads directly into his mouth."

They passed into the aromatic shadows of a row of lemon trees. Llobportis leaned his back against one, still feeling the joints of one hand with the other. "I'm not sure I follow. Change that: I'm sure

I don't follow."

"Our two problems are, in reality, one. You worried about a mysteriously cursed light display. I worried about mysterious men from the east who seek to destroy magic. I have heard of Taprobane: It lies far to the east, beyond Africa. And the common thread of the two stories is—"

"A brown robe and a staff? Be serious, Djeenek. Irrelevant detail added to unsubstantiated rumor."

"A rumor which, to my mind, gained substance at Ragana's. This problem is no longer yours alone, my firend. I will now return to the Malachite Tower, while you attend to your routine business, imprisoning debtors, or whatever. There, I will prepare a Spell of Tracing, by which I will scry his path since he arrived here from the sea. Following it back will enable me to follow him forward."

"Good police procedure. I'll get some of my boys

on it, too.

Dieenek looked pained. "Such duplication of effort seems to me a needless waste of time. Do you yet doubt—"

"Just to keep them in practice," Llobportis said soothingly. "Something to keep their minds off torturing prisoners."

"I cannot argue with such a socially laudable goal."

They parted at the corner, each striding off on his errand.

"I do not understand it." Djeenek said. "I cannot understand it. There was no trace of him. None. My speculum remained blank and roiled with smoke. And the actions of a magician are often the easiest to trace."

"Say what you like about the powers of magic," Llobportis said. "But good legwork always pays off." He was unable to keep a bit of smugness out

of his voice.

The alleys between the warehouses of the dockyards were dark tunnels, roofs arching overhead. The air was filled with the cries of men sorting cargo. Sweaty, muscular bodies appeared in the dusty beams of sunlight from above, and vanished again, lugging sacks of grain, slabs of copper in the shapes of ox hides, or a caged leopard, its eyes shining in hatred and terror. The atmosphere was thick with the smell of spices. Ahead, through a mass of ostrich plumes, could be sensed the sea.

"Grammadurhu," Llobportis explained as they walked, "came through the customs gate yesterday morning. No goods to declare, save his 'knowl-

edge,' as he put it."

"Too clever," Djeenek grunted. "Cleverness, in magic, is a great danger. Spells should be cast for vengeance, for lust, to save a soul, to complete a great work—always for some human passion. Witty magic is a disaster, for the self-directed intellect delights in setting itself paradoxes which, sooner or later. destroy it."

They emerged on the quayside, into the sun and breeze. Before them stretched the harbor. It contained scores of ships, each with its embroidered square sail billowed out with phantom wind. The surface of the water was roiled and frothed, testifying to the opposed wills of ships' magicians.

A small granite storehouse with barred windows stood at the foot of the quay. Llobportis poked his head into the black hole of the door and shouted. Despite the fact that he spoke no words, his voice was redolent of threat, of force, of punishment, of pain.

Djeenek looked startled. "What was that?"

"That, my friend, was the Voice of Authority. I got top marks in it at the Academy." "I can imagine."

"I hear, I hear," a voice said from the darkness.

"Shout no more: I emerge."

A fat, sweaty man, balding, dressed in a white robe, appeared at the door, blinking in the sunlight. "Yes, oh my gentles?"

"I've found you out, you old faker," Llobportis screamed. "Confess now, and you'll save yourself

the strappado."

The fat man waved his hands childishly in the air. "Oh, good sir. I hardly know where to begin! Perhaps with the pomegranate I thieved from my sister while she admired the butterfly. How she cried upon the discovery, sir, how she cried! I shudder even now to remember it—"

"What the hell are you talking about?"

"You called upon me to confess, and confess I shall, rest assured, sir. Confession cleanses, and I am grateful. Just the other week I kicked a cur in the street. It whined and yelped most piteously, and—"

"I want real crimes, not these mindless moral irregularities, damn you! I want forged bills of sale, I want unregistered fetishes, I want spells of necrosis and spells of suppression, from Ophir, from Colchis, from Taprobane."

The fat man looked at him with one eye narrowed, calculating, running the possibilities over in his mind. "I assume, sir, that most of your questions are what I was taught as a lad to call "thetorical," for effect merely, desiring no answer. Once these are eliminated, but one remains, and I cannot help you with it. The gentleman from Taprobane left yestermorning, has not returned, and did not confide his plans to me."

"What is your name?" Llobportis barked, disconcerted at having the husk of misdirection winnowed so easily from his kernel of intent, and

having no better question available.

"Annom, sir, at your service." The fat man bowed.
"Now, if there are no further matters, I must return to my tasks."

"Not so fast! Take us to his ship."

For the first time, Annom was taken aback. "But the way . . . it is not ready, sir. The quay is being repaired, cargo loaded. A carrack from Hyperborea is attached with a remora and cannot move; it must be careened and scraped. In short, good sir, I would oblige—"

Llobportis laughed, a hard laugh, pleased at having regained the initiative. "So not only the pomegranate weighs on your conscience, eh? Missing tax stamps? Forged inspection glyphs? Smugeled basilisks? Fool! I'm after redder meat than that, and I want to see that man's ship, now. Do you understand?"

So, slowly, reluctantly, like a student dragging his way to his tutor's house with his lessons unlearned, Annom led them down the quay. They ducked under the complex curves of fishing net hung up for mending, dodged cranes and rolling barrels.

Two ships were tied up next to each other near

the end of the quay, one silent and deserted, the other athunder with activity as a dozen roustabouts unloaded a consignment of boxes labelled "Cotton." Seeing Llobportis and Djeenek, they froze with guilty and worried countenances. At an irritated gesture from Annom, they resumed unloading with an almost burlesque seriousness.

Llobportis glared at him, "You are an idiot,"

The fat man bobbed. "Yes, kind sir, indeed."
"And your men are idiots."

"That, I certainly cannot argue with."

"I'd arrest the lot of you, and confiscate your 'cotton,' but you're such idiots that in order to still be alive, you must be under the protection of some god. And if that god is as much of an idiot as his worshippers, in trying to save you he will trip and knock the world off into the eternal abyss."

"The gentleman has an interesting theology."

"This is Grammadurhu's ship?" Dieenek asked. gesturing at the silent vessel. It was long and low, with posts curving up at both ends, simply carved. with no sign of a guardian figure. The hull was black with a substance that, in the hot sun, revealed itself to the nose as pitch. The sail was an oddly shaped, undecorated piece of graying linen. A rat poked its nose above the gunwale, twitched its whiskers at them, and vanished.

Cautiously, with many warding gestures, Djeenek inched his way onto the Taprobani ship. He hunkered down near the mast and set up his apparatus: a gold tripod, a pendulum of black string with a quartz crystal as weight, an oil lamp in the shape of a spider, and a cast bronze head with the flat face of a tousle-headed boy, mouth open in a scream. He laid the head on the tripod, face up, poured powder into the mouth from a small bag. and lit the lamp underneath. Then, holding the

pendulum directly above the mouth, he began to sing the incantations in a low monotone. For a long moment, nothing happened. Like the eruption of a volcano, blue smoke began to pour from the mouth. Despite the fact that it was quite a breezy day, the surface of the harbor choppy, the smoke rose in a perfectly straight column into the sky, puffing out just noticeably around the quartz crystal, but otherwise remaining of constant width.

Djeenek stared up at the smoke in disbelief. "Begone," he said, and the smoke was just smoke, blowing about in the wind. With the same intentness as before, he collected the equipment, put it back in his bag, and climbed out of the ship. Silence.

He sat down on a stack of aromatic cedar wood and groaned. "This is impossible. That smoke, in the form I produced it, will billow to the site of forces indicating the past or present use of magic. Perform this spell in a freshly opened crypt that has been sealed a thousand years, in an alleyway used by leatherworkers for the sole purpose of relieving themselves, in the center of a field on the Central Plain, and the smoke will twist itself into a dozen tendrils, finding the site of every muttered curse and every dropped and recovered good luck amulet. Magic is everywhere, and that smoke seeks it out. There is none on that boat, None, No water sealing on the hull. No antirodent incantations. No protective cantrips. No orientation spells. The wood comes from unblessed trees, cut with unsanctified tools. No wards protect against intruders. And the damn sail is triangular.

"Has all the earmarks of a swindle," Llobportis said, "although who's being swindled, and for what, I have no idea." He leaped aboard the boat and began to search it, overturning baskets and feeling the hidden bottoms of clay pots with one arm.

"Kind sir, do not the Taprobani keep venomous snakes as pets, as a means of insuring good fortune?"

"Agargh!" Llobportis fell backwards, breaking the pot he was in the process of examining, scattering grain over the boat.

"Or, oh dear, was it Egypt where they did that?" "You imbecile!"

Annom shrugged. "I was always a fool at geography. I was often soundly beaten for it."

The crew at the next berth, having unloaded their cargo with admirable speed, climbed aboard their boat and prepared to leave. A short man with a mass of curly hair and a gold earring, dressed in the robes of a maritime magician, released a dove as a token of safe passage, undid the mouth of an embroidered sack, and chanted the wind invocation. There was no response. He mixed two powders together and tossed them into the air, where they vanished in a sickly flash, and again chanted. Still the sail remained limp. A taller man wearing leather cuirass and greaves with a short skirt, apparently an authority figure, shouted at the magician, who shouted back. An argument developed. The rest of the crew shouted helpful suggestions.

Llobportis and Djeenek exchanged a glance and sauntered over to the other ship, which grew silent.

"May we be of some assistance?" Djeenek said.

No one responded. The nautical magician turned his back and muttered desperately, shaking the bag as if suspecting the wind had simply gotten

stuck sideways, or something,

"This vessel must be moved immediately," Llobportis said, in a brassy official voice. The crew stared at him with popping eyes. "This end of the quay will be cleared and the foreign magician's ship placed under seal of interdict." There was a brief shuffle, but no concerted action, "If you do

not move your boat, or give me a good reason why you cannot, I will be forced, reluctantly, to place your vessel, its crew, and its contents under seal as well."

The crew's countenances grew mournful. Still, no one moved.

"Speak, curse you all!" Annom shouted.

The tall man in the leather armor shoved the curly-headed magician forward, obviously using some degree of force. "This son of a worm claims to be a magician." The other's face grew red. "But he cannot raise even a simple phantom wind. Why am I cursed with this incompetence?"

The magician waved his arms. "As the Mage is my witness, I have never failed you before. Do you not remember, when the serpent stalked us in the

Propontis-'

"That was then. This is now."

The magician shrugged at Djeenek, recognizing a fellow practitioner. "Is that not ever the tale? Labor through the watches of the night...."

The two climbed aboard, followed by a nervous Annom, and the sea magician consented to explain

his predicament.

"It was that confounded whale's pizzle Grammaticus, or Graminivorous, or whatever. The foreigner from the east. He's gimmicked my spell." The captain snorted. "By the Mage's twisted staff, it's true enough. That wart on a boar's behind was here just the other morning, may his sister bear a dozen cannibal imps. He's cursed me, and stopped my wind!"

"No such luck," one of the crewmen said, holding his nose. The others laughed. The magician whirled, ready to cast a curse, but was swung back

around by his captain.

"Grammadurhu of Taprobane?" Llobportis said. "A man with a brown robe and a staff?"

"I believe that was the infected tapeworm's name.

I hope his liver shrivels up like a raisin and the bile pours into his heart, that-" "What did he do?"

"He came and spoke to me, one ship mover to another. He has no crew on that boat, and directs it himself. Even coasting, that is no mean feat. I was friendly with him. The serpent that strikes is always the one we have pressed to our bosom! He asked me how we 'tacked' against the wind, as he put it, using its force to go in a direction other than the way it blew. What nonsense! I told him we raised our own wind, like anyone else. He laughed. I should have caused his rectum to contract, so that he swelled like a pufferfish. He told me that raising a wind is impossible, that one had either to use the wind that blew from the skies, or row. Row! Like ignorant marsh dwellers. A simple spell would have turned his nostrils into nests for hornets, yet I did nothing."

"Then what?"

The sea magician frowned. "We spoke further. He told stories about the winds, and about his triangular sail, which allows him to sail into the wind. He spoke of banks of oarsmen, of seasonal winds, offshore breezes, trade winds, westerlies. It was most enlightening, I confess-"

"Sounds familiar, And was that it?"

"What an ill-formed curse that was! Where goes this world if even curses have no grace?"

"I don't know, Anything else?"

"No. Having thus relieved himself in my bathwater, the hyena- Wait. He did admire my blade, his own being crudely made, indicating neither edge nor art." He pulled his dirk out of its scabbard and looked at it pensively. "I should cast the thing into the sea. Its blade will slither away like a serpent, or will cease to cut, or will assault me as I sleen."

Llobportis took it from him and examined it. It was an ordinary blade, hill in the shape of a snarling leopard. He looked closely at the tooling marks, and stared, one-eyed, into the leopard's mouth, as if contemplating pulling a tooth. "What did he say about it?"

"He asked me how it was made. I know nothing of these matters, but made some remark on the subject of fire elementals, off-handedly. I went out of my way to be friendly to that unpleasant discharge of a man, and he sneered at mel Said there was no such animal. Why did I not conjure stickle-backs to swim in his bladder? I told him to be off. He asked where I had acquired it and I..." He trailed off, noting the expresson of interest on his interlocutors' faces. "Mh... however, since I... won it in a dice game, I could not tell him where it had been made. For some small remuneration, however, I.—"

"Hallane's work," Llobportis said, irritated at this petty chiseling. "The pattern is quite distinctive."

This last failure unmanned the sea magician, and he turned and walked toward the other end of the ship with hunched shoulders, enduring the jeers of his shipmates.

"So after Ragana's, Hallane's," Llobportis said. Djeenek and Annom followed as he jumped back onto the quay and strode off.

"Some wine, good sirs?" the fat man said when they reached his storehouse. "I would be most honored—"

"No time!" Llobportis said, annoyed at this unexpected hospitality.

Hurry is death to the contemplative soul, while

rest and drink are its resurrection."

Llobportis stared at him for a long moment.

"You wish to delay us. In the Mage's name, why?"
Annom bobbed. "The gentleman is, as always, observant. In the event, observe this." He turned a crank on the side of his storehouse, and a slender white pole descended jerkily, finally coming to a horizontal position about a foot off the ground, where it blocked the quay. "Our new customs barrier, provided, for a fee, by our friend from Taprobane. It replaces the barrier forced upon me by the Sacred Consistory: a wall of phantom fire fifteen feet high, which sounded with, as the specification had it, 'the clangor of a brazen bell.' "

"Sounds impressive," Llobportis observed.

"Ave, that it was, good sir, But, for a purely symbolic boundary marker, rather obtrusive. Last night, I must say, was the first unbroken night of rest I've had since taking employment here. Glad I am that he explained the logical impossibility of that wall of flame to me."

"It is madmen such as you that will destroy us all." Dieenek said, his voice heavy. Annom seemed

unconcerned.

"Hurry, hurry," Llobportis said. They left the fat man so, raising and lowering his new, silent customs barrier.

They had, by this time, learned their lesson. So, past the clanging of metal being beaten into submission they went, past the crowd of apprentices. leather-aproned, skin blackened, as they lay and watched the juggler, gathering their strength to return to wrestling with iron bars, past the glow of forges and the crooning songs of master smiths as they coaxed swords from folded metal, past the hissing stink of tempering. Past it all, and straight to the core of silence and dismay: the shop of Hallane.

And silence there was, within. No imprecations. No tongs or hammers tossed about in rage. Just a semicircle of apprentices sitting cross-legged on the floor, their eyes wide, fixed on their master, who stood at his anvil, running his fingers over and over an unfinished sword. He wore only a loincloth and was lean, his muscles as clearly delineated as if he were a statue. His chest, the insides of his arms, and the backs of his hands were dark, patinaed like ancient bronze, for he had given up the life of those parts in return for the power to handle newly forged metal.

He looked up as they entered. His beard moved in golden curls, unsinged by heat, and his eyes had the satin gleam of pewter. He nodded, as if he recognized them. "In his battle with the Leviathan," he said, "the Mage flung his crooked staff, and the sea, like a living thing struck by a hammer, froze and froze and became as ice, but the fish were yet alive within it, as quicksilver lies within cinnabar, alive and ashine, but held by the matrix."

"But when the Leviathan had been vanquished." Djeenek said, "the Mage beseeched the Fair Lady, the Sun, to admire herself in the mirror of ice. She did so, and so bright was her face that, in an instant, the fish were once again in their sea. In the same way, you heat cinnabar in an alembic, and release its mercury, as I am sure you have done here many times."

"Heat we have not," the smith said. "The heart

of fire is gone. The foreign magician stole it with

him and left us but cold casuistry."
"The usual uneven exchange," Djeenek said, laying his hand on the great vessel that had held the fire elemental of the smithy. It was cold to the touch.

The smith noticed his look of surprise, "It has been but minutes. Once life decides to flee, it does

not linger."

"Do you know which way he went?" Llobportis said.

"Toward the hill of the magicians. He had tired of dealing with 'menials', as he put it, and wished to seek the roots of knowledge.

"And do the roots of knowledge lie on the heights of the magicians?" Dieenek said, half to himself.

"That is just as he spoke, for he said that the Tree of Knowledge had been uprooted in this land and must be put back aright.

"We could do as he suggested," one of the apprentices said, "and make a-what did he call it-a 'bellows', to blow onto burning wood. He said the heat would become great enough to-"

The master smith looked at him wearily, "Hush, my child. When the breath of life has stopped, can you replace it with a mechanism?" He ran his fingers, shaking now, down the length of the sword once again, And thus Dieenek and Llobportis left him.

The juggler tossed his torches in a fountain high overhead, the flames reflected in his dark, sweatsheened shoulders. They paused, captivated by the grace of his performance which, the product of brain and muscle alone, was unaided by magic.

"We must alert the Consistory," Llobportis was

saying. "Call an extraordinary session."

Djeenek looked at him, slightly quizzical. "That collection of poseurs and exhibitionists? What for?"

Llobportis sputtered. "This man is an evil sorcerer, obviously of great power. You must join your strengths together, against his, and destroy him"

"The strength of us all together will not suffice to stop him."

"Is he that powerful, then? He must be an avatar of the Mage himself!"

"No!" Djeenek said, too sharply. "Quite the opposite. His power lies in that he is not a magician at all."

"Stop speaking in conundrums!"

"Conundrums they certainly are not. An illustration should prove more enlightening than a lecture, I think." He pulled a gold piece from his
purse and tossed it into the juggler's bowl, where
it landed among the coppers with an impressive
clank. The performer swiveled, not breaking the
flow of his act, and bowed slightly toward them.
Djeenek crooked a finger. The torches ceased to fly
and the apprentices, disappointed, drifted away.

"Much thanks, sir," the juggler said, approaching. "How many years have you been performing?"

"Oh, many years, since a child I was."

"Excellent. In that case, could you explain to us how the thing is done?"

"How it is done?"

"The juggling, of course. What actions do you perform, and in what order. Tell me straight, now, and simply, with no tricks, or misdirections to mislead the uninitiated."

"No misdirections-I just do it."

"Nonsense! Such exercises are certainly amenable to analysis. As an example, detail for us the performance of the fountain of torches. Each catch

of the hand, each turn of the wrist-a simple request, surely.'

The man closed his eyes and frowned, making unconscious gestures with his hands. "I toss this one here . . . flip that one over . . . no . . . wait . . . I catch this one thus ... but not before tossing the other. . . ." The sweat, which had dried on his face. began to reappear. "Now, now," Dieenek said, "Do not fool with us.

for we are gentlemen of quality who want a simple explication of your trade. We do not seek to steal your secrets, so there is no need for you to conceal them."

"I conceal nothing!"

"Very well, then. Run through your fountain. concentrate intently on the motions, and then explain it to us. No need for the torches: use those clubs there."

The juggler picked them up and, looking at his hands, commenced to toss. The clubs flew up randomly in the air, one of them coming down on Llobportis's head with a thump. The juggler's cry of anguish was louder than that of the policeman.

"Again," Djeenek commanded. "And pay attention this time.

Again the clubs flew, and again they crashed to the ground. Llobportis managed to cover his head.

Dieenek crossed his arms. "No satisfaction from you this day, I see. Practice your craft, sir, practice your craft. Simple advice, but true. Good day."

He strode off, Llobportis following, leaving the juggler standing in the empty square, surrounded by scattered juggling clubs.

"You've lost that man his livelihood through that spell." Llobportis said. "Why?"

"You are confusing metaphor with reality, He'll

cease thinking about it long before he's managed to spend that gold piece. And no spell was involved. merely the innate perversity of the human mind. Were you really so dull as to miss the lesson?" "Well. I-"

"The human mind is overly amenable to reason. And magic, like most great human achievements, exists outside of reason, often contending with it like a fish swimming upstream. Since the Mage invented that way of looking at the world that we call magic, and floated islands and raised whirlwinds, we have been performing a juggling act. This madman from Taprobane now wishes us to watch what we're doing, and drop our torches. He would send this whole sunlit world aglimmering."
"I never knew that magic was so fragile a thing."

The street down which they walked was long and silent, lined with lemon trees. The facades of

the rich houses glowed in the afternoon light, their guardian figures, lions and bulls, regarding the

interlopers with bored suspicion.

"There, within those houses, you will find fancies of blown and fluted glass, like transparent undersea creatures. One careless hand, one vagrant puff of breeze, and they fall to the floor and shatter into lacerating shards. And yet, when the sun shines on them through a half-open window, as it does now, late in the day, there is nothing more beautiful in all the world.

"Murder!" a woman's voice cried, "Oh, murder!" The call came from down a narrow alleyway. After sorting themselves out at the entrance, they made quick time, to find a woman dressed in blue, a matron, with heavy earrings and elaborately coiffed hair. She leaned dramatically against a wall, the back of her hand pressed against her

forehead.

"Who's been murdered?" Llobportis asked.

She regarded him demurely through long evelashes. "No one, thank goodness. That would be just what I need.

Llobportis's face darkened, but he retained his composure, as all policemen must when dealing with the wealthy and capricious. "Then why cry murder?"

"It is easy to scream, and gets results, as you can see. It stands as symbolic of all crimes. My pet griffon has been stolen' is much more difficult. But," she sniffled, "some bastard did it!" She pointed at an empty neckring, attached to the wall by a chain. "And murder's the best he deserves."

"Someone stole your griffon?" Llobportis said. "Claws, beak, nasty temperament, and all?"

"Varlam had a very gentle temperament," she said. "He never bit anyone who didn't deserve it."

"How did it happen? And did it get done with-

out cutting through that neck ring?

"I am not familiar with criminal techniques as, I suppose, you must be, so I'll leave details like that up to you. But I heard Varlam arguing with someone. It was getting a little loud, and I was trying to take a nap, so I came down to see what it was about, and Varlam was gone. Just like that!"

"What was the argument about?"

"It was strange. The man Varlam was arguing with was saying that Varlam didn't exist. Isn't that silly? With his claws so nicely varnished, and all. When was the last time you heard of anything not existing that had varnished claws?"

"Not recently. What then?"

"Well. Varlam, bless him, argued his case strenuously. But he started to get a bit doubtful, I thought. That animal is no moron.

"He knows a logical argument when he hears one."

"Exactly! Finally, I heard the man say, 'taxonomically, you cannot exist', Well. I knew then that he was from the Ministry of Revenue, Imagine that! Where will it all end?"

"I'm afraid to think about it. Is that it?"

"Yes, When I got down, Varlam was gone, Probably hauled off to the Ministry to have tax stamps put on him, which he won't like, let me tell you, not one bit. One of those bastards is going to lose a finger, or worse." The thought cheered her.

"Which way did he go?"

"He didn't come past me, so he must have gone out that end of the alley."

She called after them, "He'll be hungry when you find him. Feed him a couple of live frogs. He loves them. No salt."

The air had that luminosity peculiar to twilight, when the world, overreaching itself, resolves to glow in the absence of the sun, and all the details of life, from the leaves on the laurel trees to the cracks in the plaster behind the spouting head of a fountain, achieve, for an instant, an aching significance. They toiled up the twisting stairs that led to the Street of the Magicians.

"That is where he is, of course," Dieenek gasped. "I should never have doubted it. It is not in the seeking that one finds, but in the being sought,"

"What are you blathering about?" Llobportis said. "You know where he is?"

"It was where it was inevitable that he should

end up. In the chambers of the most powerful and most respected magician he could find."

"That makes sense, in a sort of self-aggrandizing

way."

The silhouette of the Malachite Tower thrust itself into the last glow of the sunset. Just below the peaked roof glowed a single window, that of Djeenek's study. And, dimly seen, there was one impatient, pacing figure.

Grammadurhu, a tall, stooped man with a nutbrown complexion and, for such is the nature of eyewitness testimony, a gray robe, stood contemplating Djeenek's irrigation table. He looked up as they entered, irritated, as if they were late for an appointment.

"You're under arrest!" Llobportis shouted.

The man just looked at him. "Do you feel that your legal procedures are in need of improvement? Not strictly my field, mind you, but I am willing—"

Llobportis grinned, nastily. "The Prefect has had a problem lately, something right up your alley, now that you mention it. Seems some of the racks in the Municipal Torture Chambers have been causing dismemberment rather than simple joint dislocation. A firsthand study on your part might give you some ideas...."

Grammadurhu blanched under his dark skin, but managed to cock an eyebrow. "Your threats are, I am afraid, a bit too literary to be as fearsome as you intend."

"A common observation made by the people I have to deal with A handshake with a pair of red hot pincers always turns them around, though; I've always noticed that."

"Lloi!" Dieenek said. "You are being rude."

"Another common observation." He plopped down into the one vacant chair. "Djeenek. Produce some more of that wine, and we can interrogate this maniac in a civilized manner, without pulling

out the thumbscrews or resorting to bastinado.

Just like in the best households."

Djeenek, with his own version of the raised eye-

brow, did as he was bid.

"Djeenek the Prismatic?" Grammadurhu said.
"The master illusionist? Your fame has stretched
through the Inner Sea, and beyond." His voice was
controlled, but he avoided Llobortis's gaze.

"Illusionist?" Djeenek said, irritated. "Don't play your foolish labeling games with us here. I perceive that an 'engineer' is merely a sort of paradoxologist who sows havoc so that he may reap profit. Illusionist, indeed!" He handed the Taprobani a cup of wine, with the air of a gracious, if sorely tried. host.

"Engineering is merely the solution of human problems by the application of physical laws,"

Grammadurhu said. "It is honest work."

"Creation of human problems, you mean," Llobportis said. "I have seen no solutions, myself."

"Is it my fault if no one listens to me?" Grammadurhu said, a trace of exasperation coming into his voice.

"They listen too well, damn you!" Llobportis shouted.

Grammadurhu shrugged his shoulders and walked over to the diorama. "Is this some sort of irrigation device?" Silence. "Nice model. Good work. I particularly like the modeling on the peasants' faces. It's hard to get a surly expression on something so small." This attempt at friendly praise was likewise greeted with silence. "But where are your shadoofs?"

Almost against his will, Djeenek said, "Shadoofs?" Using his staff as an aid, Grammadurhu described a pivoted boom with a bucket hanging by a rope from the long end, and a counterweight at the short end. "Dip the bucket in the lower water, raise it, and dump it in the upper. Water can't flow uphill, you know."

Djeenek covered his ears. "Cease!"

"And what are these?" Grammadurhu said, prodding the floating islands with a finger. "Suspended rocks," Llopportis said, "The peas-

ants use them as safe refuge from bandits and tax collectors."

"Eh? Floating rocks? Preposterous. Impossible. How could rocks float? Rock is denser than water it's a matter of specific gravity and displacement."

He lectured and drew diagrams in the sand, explicating matters of common sense and observed experience, and demonstrated how the former was more important than the latter. And slowly, slowly, as if reluctant to be convinced, but finally overwhelmed by mathematical certainty, the rock islands settled to the bottom of the bowl. Djeenek stared at them in horror, sweat coming out on his forehead. He looked up. "Why has the Mage decided to return in the person of an insolent foreigner to provide us with a new dispensation? Have we really used his invention so badly?"

Grammadurhu started. "What nonsensel As a sandal maker sees the men about him solely in terms of their callused feet, so you see the world entirely in terms of this idiotic magic of yours, including those things naturally opposed to it, thus completely ignoring reality. But reality presses in on you, without the need for your Mage's intervention. You are like a man holding a wolf at bay by the sheer power of his gaze. Your gaze is sharp, and the wolf hangs back, frightened, dominated. But now you feel your attention wavering, your eyelids drifting closed, for reality can never be held back for long. And as you float off to sleep, you hear the growling of the wolf. ..."

"I hear the rantings of a dangerous criminall" Llobportis said. He reached into his robes and pulled out a knife. "Now, if you will be so kind as to accompany me, we will go the Ministry of Magical Affairs, where you will be tried, found guilty of dangerous and illegal practice of magic within city limits, and condermed to be scraped raw, simmered in lemon juice, and fed, still alive but well flavored and tender, to the sacred apes of the Temple of Lord Mok the Cruel. That is, unless the Sacred Consistory demands that you be bound over into their custody. They're hell on unlicensed magicians practicing on their turf and are liable to do something really nasty."

"Magic?" Grammadurhu said nervously. "I prac-

tice no magic. I'm an engineer, I tell you!'

Llobportis grinned. "Tell that to the apes. You've cursed a shop display, freed a phantom wind, stolen a fire elemental, and dispersed a griffon. If you are lucky, they'll make the apes gargle with rosewater. The stuff they eat, I hear, gives them terrible breath."

"Ah, well," Grammadurhu sighed. "There is still, I think, one condition to be satisfied before Lord

Mok's monkeys dine.

"And what might that be?" Llobportis said, mov-

ing in.

"You must catch me!" With a sweep of his staff, he knocked a bubbling retort to the floor, where it burst into a roar of flame. Djeenek flipped a pinch of powder at it, spoke a word, and the fire was out. But so was Grammadurhu.

Llobportis ran to fling the door open in pursuit, but it refused to budge, and he was thrown back.

"He's cursed the thing!" he said. "At least your door guardian will hold him until you unhex it."

"It didn't seem to prevent his entering," Djeenek

said. His shoulders were slumped, his face gray, and he spoke in a soft voice. "And as for unhexing

the door, I fear that-"

"Damn you!" Llobportis said. "The least we can do is kick that wolf in the chops." And he threw his shoulder against the door, once, twice, and, with a sound of shattering wood, was through. The staff that had been wedged against it was splintered in two. He turned and paused at the door, looking at Dieenek expectantly.

"Logic doth make fools of reasonable men," that one gasped. "The only solution is to be unreason-

able. Let's have after him!"

Outside, through the window, could be seen the moon. It rode a cloud, like a pearl still resting in its mother. It provided a most transparent light perfect for a chase.

The city never seemed as alive as it did that night. Flickering lamps illuminated latticed windows, and the clank of pottery, the laughter of friends in converse, and the self-satisfied buzzing of the lyre seemed everywhere on the clean night air. And through the center of it all was the slap of sandaled feet on stone steps and the tearing of breath through anguished lungs as Llobportis and Djeenek ran toward the docks.

The Trader's Esplanade was shuttered and empty, the warehouses silent. Chickens awaiting the morrow's market clucked sleepily within their baskets. Bruised from too many rough contacts with unseen walls, they stumbled through the tunnel between the warehouses, coughing at the smell of uncured hides.

Ahead, just visible in the darkness, was the robe of Grammadurhu, sweeping down the quay. They emerged from the tunnel and ran, the nearness of

their quarry making the pain in their chests almost bearable.

"Aaaah!" Llobportis cried, as his knees encountered the customs barrier, which had somehow come to be lowered since Grammadurhu had passed. He toppled over, slamming down on the pavement. He groaned again as he felt Dieenek land on him.

The door of the storehouse opened, releasing a blaze of light. Annom regarded them solemnly. "Forgive me, gentle sirs. The customs barrier should not be down at this hour." Humming to himself, he began to turn the crank to raise it.

Llobportis jumped to his feet. "It wasn't down until you put it down! Why?"

He was already running as he spoke, but just managed to catch the reply. "The gentlemen are exceedingly bad for business."

They ran through the sleeping guards of the vessels, leaving consternation in their wake. They finally reached the end of the quay. The next-to-last berth still held the ship that had lost its wind, its sail now torn in half to form two triangles, which were crazily wrapped around spar and mast. The last berth was empty.

Dimly perceived, in the path of the moonlight on the water, was a moving vessel, its sail set for foreign climes. A ripple, and even this vision was no more. The visitor was gone, leaving the quay, the city, and all Atlantis behind him.

Djeenek, calm descending, flipped a chip of stone after him. It struck the water and vanished. Rocks don't float. He tried not to think about it.

He failed, of course,

### EDITOR'S INTRODUCTION TO: THE BOND

#### by David Drake

David Drake is best known for the gut-wrenching hyper-realism of his stories of future mercenaries. How might the author of *Hammer's Slammers* respond to the proposition that we *must* all love one another?

As you read this story, think about Gribbin's article and Schrödinger's cat....

# THE

#### David Drake

The bipedal—thing—with orange feathers disappeared a foot in front of Alice Hobart as suddenly as it had blurred into sight a moment before.

"My God!" she said. The cup in her hand rattled badly enough against its saucer to slop coffee. "Mary, I swear I can't imagine how you get used to it! Seeing monsters wander through your house is one thing, but that was coming right at me. It

could have touched me!'

Mary Chasten smiled. She did not remark that the Hobarts had pretty well invited themselves. Not that Steve and Alice were precisely unwelcome; but it was an awkward time. The nexus was approaching one of its periodic peaks. In fact, the level of extra-dimensional appearances was already so high that the Chastens were both sure they should have begged off for another few days instead of having their friends over for dinner tonight.

"Well," Mary said, leaning forward to hand Alice a napkin, "it could have touched you without any harm, you know. It's happened often to John and myself. There's a tingling, is all. They think it's—"she swallowed to cover a catch in her breath "—a chance intersection of nerve impulses."

Alice had reached for the napkin, but her fingers did not close over it. Mary turned to follow her friend's goggling eyes. Something with scales and a dazzling, translucent mane had walked through Mary's chair. It had missed her by no more than the amount she had leaned forward. The plane of intersection between the chair and the—visitor—was as sharply fluid as that of a shark's fin cleaving the sea.

"My God," Alice repeated as she took the napkin. Her hostess twisted minusculely to prevent their fingers from touching. "And the news says there are more of these places appearing every

day. My God."

"Well, that was rather fortunate for us, you know," Mary said. The scaled creature was still quite solid in appearance as it strode through the walled-off area in the center of the Chastens' living room. The creature ignored the door as it ignored everything else in the room, including the humans. "The government was determined to force us out of our house in order to study the nexus. With others springing up here, there, and the other place all over the world, they could have their 'studies' and leave us in peace. I never heard their studying had accomplished anything worth the mention."

"In peace." Alice said with a moue of disgust. "I dread to think what's going to happen if it gets so that nowhere is safe from these—things." She looked away from the blank wall. "Of course," she added with a tinge of bitterness, "it may mean sweetness and light for everybody. Living in a zoo certainly seems to have agreed with you and John."
"Oh, we fight just like we always did," boomed

John himself as the men re-entered the living room. Steve Hobart trailed behind, holding the camera with which he had been trying to photograph the temporary inhabitants of the nexus. "Thing is," John continued, "we make do now because we can't split." He grinned broadly. "After all, how could we decide who got the house?"

The closed room in the middle gave an odd appearance to what had been a large, sunken living room. It now had the look of a hotel lobby with an elevator shaft in the center. As Steve opened his mouth to speak, something gray and smooth shimmered out of the central wall. It faded, then sharpened into focus again a foot or so into the room before it disappeared completely. Hobart rapped the wall with his knuckles, testing its solidity.

"It doesn't really have anything to do with the wall, Steve," Mary remarked. "Will you have some more coffee—" she darted a glance at the wall

clock "-before you go?"

"What is inside here, anyway?" Hobart asked,

trying the knob of the door. It was locked.

"Just a storeroom," said John Chasten, walking calmly to the couch under the clock. "We closed off the center of the nexus, though it's no different from the rest of the house, except for the frequency

of appearances there."
"Too much of a good thing, huh?" Steve said.

He stepped to the side. Beyond the picture windown, dimly glimpsed against the summer dusk, something walked across the air. None of its feet were close to the steeply-sloping ground. 'No two of them the same?' Hobart commented with a shake of his head. "Well, it's interesting, but I

can't say I envy you guys."

"Occasionally you'll see the same, well, species," John remarked, glancing at his own watch. "What looks like it, at any rate. I understand that statisticians think maybe ten thousand, ah, dimensions impinge at each nexus. Or at the ones the government's studied most, at any rate, though there doesn't seem to be a great deal of difference."

Alice grimaced. "I wish they'd learn what's causing it and stop it," she said. "I get the heeble-jeebies every time I think of one popping up in my living room—or bedroom—and nothing I could do

about it except move."

"If you'd read the article, like I told you to do before we came over, you'd know, wouldn't you?" her husband snapped. "They think one of the other dimensions is deliberately causing them to form. They may be mining minerals from us—or energy."

"If I did everything you told me to do, I'd drop right off the face of the Earth, wouldn't I?" said Alice Hobart in a rising voice, "You'd like that,

wouldn't you?"

In the startled silence, Mary said, "I don't think that could be, Steve. Nothing ever appears but the people—the creatures themselves." She gestured at a trio of tentacles undulating as they projected briefly through the central wall. "And certainly nobody's been strip-mining our carpet or setting up solar panels in the fireplace."

"And after all," John chimed in, "people have tried to trap and even shoot the—the others." He scowled murderously. "Including representatives of the so-called authorities, I'm told. I wonder if they gave any thought to what might happen to us if that sort of nonsense hadn't been completely

ineffectual?"

Alice screamed and lunged out of her chair. Her saucer and cup sailed off in separate parabolas. The few remaining drops of her coffee straggled across the white ceiling. The creature that had materialized in the woman's chair continued its leisurely progress toward the central room before it faded away. The creature had an exoskeleton and more legs than anyone could count during the moments it was present.

John and Mary ran to their guest. Steve Hobart himself paused uncertainly, halfway across the room. "Oh, my God," Alice was moaning, "it was like ice all through me! And then it came out my front as if-" Her voice trailed away without a

simile adequate to her horror.

The Chastens carefully helped Alice to her feet, steadying her by the puffed sleeves of her blouse and Mary's hand on her waist. "Yes, that can be a surprise the first time." John murmured awkwardly.

Steve had bent to pick up a piece of the broken saucer. He said, "There's a guy out in Idaho who says the experience can actually be pleasurable. you know? Claims when it happens that he feels what the other thing is feeling and what he's feeling himself at the same time. A double, ah, kick."

The Chastens had stepped back while their guest stood shivering. John smiled and said dryly to Steve, "Does he say what he was smoking at the time?"

"Yes, goodness," Mary added, "If Washington decides this is some sort of drug trip, they will take

it away from people, won't they?"

"My God!" Alice Hobart blurted. Her fists were clenched and her arms were locked tightly against her breast. She stared at the others over white knuckles and cried, "I just want to get out of here before it happens again! It was awful. Awful!"

"I'm really sorry, Alice," said John in a mixture of concern and relief, "It does hit some people that way. Here, your coats are in the front closet." He mimed turning the woman without actually touching her. Still drawn up, darting fearful glances in all directions. Alice followed her host.

Mary took a deep breath and then realized that Steve Hobart was stacking cups and saucers. "Oh, don't bother with that, Steve," she said, "I'll take

care of it later."

"No, no." Steve said. "I owe you at least this much. You don't know how sorry I am about the way my wife acted." He began to walk toward the kitchen door.

Carrying the cream and sugar, Mary strode past him. "It was our fault," she said. "We don't usually have people over when the appearances are so frequent. This time it happened a little faster than we were expecting."

"Oh, she's always making a scene," said Steve. His dishes rattled. "I'm getting damn sick and tired of it, too. You know, Mary," his voice dropping an octave, "sometimes I think you're the only woman in the world who isn't crazy." He had freed a hand. It stroked Mary's bare elbow to punctuate his sentence.

Mary jumped as if she had been stabbed. She turned and Steve lurched back in surprise. He might have expected disapproval, but he had only once before seen disgust to equal Mary's present expression. That was the morning he had glimpsed himself in the mirror an instant after seeing the garden slug that had crawled into the glass with his toothbrush.

"I-I'm sorry," he stammered,

Mary pointed to the countertop she had cleared

for the dishes. "I think you'd better go, now," she said distantly.

Wishing that he could vanish like the other visitors, Hobart obeyed.

When she heard the front door close, Mary walked back toward the heart of the dimensional nexus. John, already unbuttoning his shirt, met her at the door to the central room. The air around them was beginning to cloud with micro-second appearances, too brief and too frequent to have discernible shapes. The Chastens' bodies tingled with shared stimuli as barriers broke down around them.

"Never seen it so sudden," John grumbled. He tossed his slacks over his wife's crumpled dress.
"Another five minutes and I planned to throw Steve and Alice's coats out the front door and hope they

had sense enough to follow.

"Shh," said Mary gendly. She unlocked the door and opened it. They were both nude as they stepped into what had been the center of their living room. Now, a large waterbed filled the walled-off area. They stepped carefully to the middle of the shifting surface with their hands together, almost touching. Mere physical contact was dry bread now to their sophisticated palates. The impringement of other dimensions, other nervous systems, was almost constant now. The nexus was at crescendo, nearing the climax for which it had been designed.

With a mutual sigh, John and Mary moved together as they had learned to do. Their bodies, and the myriads of other bodies, began to tremble with

an ecstasy multiplied 10,000 times.

#### EDITOR'S INTRODUCTION TO: SPACE TALKING

#### by Charles Sheffield

Dr. Charles Sheffield, Ph.D. in physics from Orpford University, Vice President of Earthsat Corporation, and currently President of the Science Fiction Writers of America, seriously addresses Fermi's question.

It is, after all, perhaps the most important question ever asked; and while his answer is not my answer, it is illuminating.

# SPACE TALKING

## Charles Sheffield

It's not difficult if you happen to be ET. You collect a few bits and pieces of electronics, join them together in some mysterious way, and lo and behold, you have a transmitter that will send a signal off to the stars. Then all you have to do is switch it on and wait for your friends to show up.

For his own good reasons, ET chose not to ask the assistance of Earth's scientists in sending his message. But suppose he had, Suppose that we were asked to send a signal to the stars, one that could be picked up and interpreted light years away. What techniques would we choose, and how would we go about it?

Communications with Extraterrestrial Intelligence: the Beginnings

The idea of sending messages that can be seen and interpreted by beings on other worlds is surprisingly old. About 1820, the mathematician Carl

Friedrich Gauss proposed that huge geometrical patterns be displayed on the surface of the earth. He argued that these, seen through telescopes by the inhabitants of other planets of the Solar System, would be positive proof that Earth also harbored intelligent life. The principal pattern would be layouts of large fields, showing a right-angled triangle and bordering squares. By using crops of different colors for each field, we would give graphic proof that we are familiar with Pythagoras' theorem.

Gauss was thinking mainly of beings who might inhabit nearby planets—Venus or Mars—which would mean the use of huge telescopes there, or gigantic fields here on Earth. However, given these limitations, the idea is not impossible, and represents amazinely advanced thinking for its time.

Other and similar suggestions, involving the lighting of great fires in the Sahara desert, were made later in the 19th century. In 1900, the French Academy of Sciences actually offered a prize of 100,000 francs to the first person establishing extraterrestrial communications (but not with the planet Mars—that was considered too easy, not much of a challenge at all!).

All these ideas have one thing in common: they assume that visible light is the way to communi-

cate across great distances.

At first, that assumption seems like a good one. We live on a planet that orbits a fairly typical star, the Sun. Our eyes have evolved to be sensitive to the light of that star, modified by passage through the Earth's atmosphere. It seems reasonable to assume that other beings, born on planets that circle other stars, will also have developed similar organs of sight. If so, they should be sensitive to about the same wavelengths as we are. They may perhaps be more sensitive to bluer light, or to

redder light, but we should share a good overlap region of wavelenths, and be able to communicate with each other by optical techniques.

This is all reasonable, but it misses one key factor. Visible light wavelengths are not the best ones to use for interstellar communication, precisely because they are so abundant through the universe. We can send a signal at these wavelengths, and perhaps another being can see it, but the signal will be very hard to distinguish from the natural signals that every star, planet, and galaxy is sending out. There is just too much clutter at visible wavelengths. Our message will be lost in the background noise that Nature is generating all around us.

What we need is some signaling system that will not be confused with emissions from stars, planets, interstellar dust clouds, galaxies, or any other natural source in the universe. We want, in fact, a "quiet" part of the spectrum, where Nature does not make signals of her own. This sounds like a difficult proposition, but fortunately, such a region does exist.

#### The Choice of Signal

If we sit down to make a list of the properties that any signaling system should have for communication over interstellar distances, the following items are sure to be included. Our signal should:

 Possess properties that make it easy to separate from naturally generated emissions.

Not be easily absorbed by a planet's atmosphere or by interstellar dust and gas.

3. Travel at high speed.

4. Be easily generated and detected.

5. Require only moderate amounts of power.

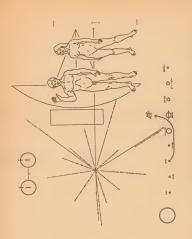
Some of these requirements are more important than others. For example, NASA has already sent an interstellar signal that violates the third one. The Pioneer 10 and 11 and Voyager 1 and 2 space-craft are on trajectories that carry them beyond the solar system, on their way to the stars. They contain messages intended for receipt by other beings, but they travel horribly slowly. It will be tens of thousands of years before they have traveled the distance to even the nearest stars. If we don't want to wait that long, we will insist that our message travels at or close to the speed of light.

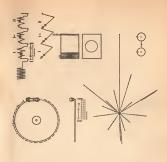
Fortunately the speed requirement can be satisfied and still leave open to us the whole electromagnetic spectrum, from X-rays and gamma rays out to very low frequency radio waves. All such radiation travels at light speed; thus some other criterion must be used to select the preferred

wavelengths.

The first systematic look at the whole spectrum to see what is best for interstellar communications was done in 1959, by Philip Morrison and Giuseppe Cocconi.\* As Morrison has remarked, they started out by looking at the possible use of gamma rays to communicate through space, and only later broadened the question to include the whole electromagnetic spectrum. After making their study, Morrison and Cocconi concluded that there are preferred wavelengths for interstellar communication. They also addressed the question of how signals at those wavelengths might be generated and received, but not who might be sending them. In Morrison's informal words, "See, you were think-

<sup>\*</sup>Morrison is now Professor Emeritus of Physics at MIT, but at the time, both men were at Cornell University.





Pioner 10 and 11 (left) carried this picture on an aluminum plate attached to the spacecraft. The radiating lines on the left show the positions of 14 pulsars relative to the Sun as center. Each line gives a binary encoding of the pulsar's frequency. At the bottom of the picture is a diagram of our solar system, including the outward trajectory of the spacecraft. If decoding this message is to easy, try the one that was sent

If decoding this message is too easy, try the one that was sent with Voyager 2 (above). It accompanied a phonograph record, and gives the instructions as to how the record should be played. The successful alien who plays the record is rewarded with two hours of Earth's music and sounds, and a message from Jimmy Carter.

ing that in order to call up somebody, you have to have somebody to call. I'm saying that before you call, you have to have a telephone system. We got our initial idea from the telephone system, not from thinking that anyone is there. We don't know how to estimate the probability of extraterrestrial intelligence, but if we never try, we'll never find it."

(Those words—"if we never try, we'll never find it"—could well be the motto for all our searches for other intelligence in the universe. But so far, the human race has not tried very hard. According to Carl Sagan's estimate, the entire expenditure to date on seeking intelligence around the galaxy is less than the cost of one military attack heliconter.)

So Morrison and Cocconi took a look at the whole electromagnetic spectrum. They reported their results in Nature magazine, where they asserted that the microwave region-the one we use for terrestrial radio and radar-is the best choice. (This rules out, for the moment, the idea of using particles for communication, since most particles have mass and need a lot of energy to get them close to the speed of light. But this is not the whole story, and that possibility will be explored later.) The microwave region of the spectrum is markedly quieter (less cluttered by natural signals) than the gamma ray, X-ray, ultraviolet, visible, or infrared frequency ranges. Nature seems to have overlooked this region-to the point where the Earth, with its copious emissions of manmade radar, radio, and television signals, has become the most powerful radio source in the solar system. At microwave wavelengths Earth is brighter than Jupiter, or even the Sun, which is millions of times bigger and brighter at visible wavelengths.

And even within this quiet microwave region,



All radiation travels through space with the same speed—
the speed of light. The wavelength of the radiation and its frequency are simply related to each other, since frequency x wavelength = speed of light = 300,000 killometer/sacond.

Either frequency or wavelength can be used equally well to describe a particular type of radiation, and both are employed in common practice. When we speak of radio or radar, we usually work in terms of frequencies; for visible or infrared light, we generally use wavelengths.

As the diagram indicates, the whole spectrum of electromagnetic radiation covers a huge range of wavelengths. from high-energy gamma rays (wavelengths of one hundred-millionth of a centimeter or less) through to long radio waves (wavelengths of many kilometers). Some wavelength ranges are strongly absorbed by the Earth's atmosphere, and so are not useful for groundbased receiving or transmission systems. Other wavelengths are strongly produced by stars, nebulae, and galaxies, which means that manmade signals in these regions will be hidden by natural ones. Today, a number of regions have also been preempted by our own radio, radar, and television transmissions. These considerations all reduce the wavelength hands available for interstellar commuications.

there is a noticeable "quietest spot," from about 1 gigahertz (30 centimeter wavelength) to 100 gigahertz (0.3 centimeters wavelength). If we are sending or receiving signals from the surface of the Earth, the absorption of the atmosphere must be considered, too. This reduces the quietest region to a "terrestrial microwave window" from 1 gigahertz to 10 gigahertz (3 centimeter wavelength).

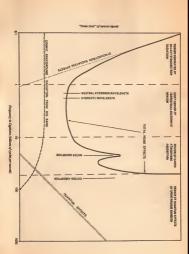
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This is the preferred band for sending our interstellar signals. At lower frequencies, below 1 giga-



hertz, the synchrotron radiation of the galaxy provides an unwanted natural signal. Above about 20 Gigahertz, the quantum noise of spontaneous emission dominates. But between 1 Gigahertz and 10 Gigahertz, the only appreciable noise is provided by the cosmic background radiation, the residual 3-degree radiation left over from the Big Bang itself. That signal is small. And by coincidence, right in this valley of quiet lie two spectral lines of materials vital to all forms of life as we know it. At 1.42 Gigahertz (21 centimeter wavelength) we have the spectral line for radiation emission by neutral hydrogen; and at 1.662 Gigahertz (18 centimeter wavelength) we have the spectral line of the hydroxyl radical. Together, hydrogen and the hydroxyl radical combine to form water. the basis for all Earth life. As Project Cyclops, a 1972 study of search methods for extraterrestrial intelligence, stated it:

"Nature has provided us with a rather narrow band in this best part of the spectrum that seems specially marked for interstellar contact. It lies between the spectral lines of hydrogen (1420 MHz) and the hydroxyl radical (1662 MHz). Standing like the Om and the Um on either side of a gate, these two emissions of the disassociation products of water beckon all water-based life to search for its kind at the age-old meeting place of all species:

the water hole.

If we are going to use radiation to send our interstellar signal, then this place, the "water hole," provides the best set of frequencies. Our signals can be generated easily, with standard radio equipment; they can be beamed in any direction we choose; and they will be detectable over stellar distances with the transmission power available to us today.

Before leaving this subject to look at other and less conventional signaling systems, there is one important point to be made about radiation signaling. There is a big difference between detecting and understanding extraterrestrial signs, and sending signals for others to receive and interpret. These two different problems are usually termed the Search for Extraterestrial Intelligence (SETI—we sit and listen, but don't necessarily send any signals ourselves) and Communications with Extraterrestrial Intelligence (CETI—we send our own messages).

As it turns out, both SETI and CETI employ some of the same technology. For example, a large radio telescope can be used to listen for signals from space; or, by placing a transmitter at the focal point of the telescope, the same instrument can be used to send signals to some preferred di-

rection in space.

The 1,000-foot radio telescope at Arecibo in Puerto Rico has been used in both modes; to listen, and also to beam a coded signal to the global star cluster M13, 25,000 light years from Earth. A radio telescope a little bigger than the one at Arecibo Observatory could detect that signal in M13, provided that it was accurately pointed toward the

source and knew the sending frequency.

The last point emphasizes one of the difficulties of SETI. If we wish to detect a signal, we have to know what method is being used to send it, and we have to know how to decode whatever it is we receive. This is a major strain on our receiving equipment, which must be able to look at many thousands of frequencies. It is perhaps even more of a strain on our powers of understanding. Many humans, when presented with the messages that were sent out on Voyager as "self-evident" signals to alien civilizations—sounds of rain, cars, a mes-

sage from Jimmy Carter, music, pictures—found them totally cryptic. The sign of intelligence? Possibly; but not an easy message to interpret, even for earthlings!

However, if we merely wish to send a signal, the burden of understanding is placed on the being who picks up our signal. As many people have remarked, the strongest signals notifying the interstellar community of human existence are military radar and commercial television. If you want something to worry about, consider the idea that The Dating Game and The Gong Show may be the first that galactic society learns of humanity's tastes and interests.

As for detection and decoding, SETI is being actively pursued today in many places. Project Sentinel is an effort by the Planetary Society, being conducted under the direction of Dr. Paul Horowitz of Harvard University. In this work, a radio telescope at Oak Ridge Observatory is now scanning the sky at 128,000 separate but contiguous frequencies, centered on the wavelength of emission of neutral hydrogen. The signal analyzer was specially developed for this purpose, and the search will continue for years-unless an extraterrestrial signal of undeniably artificial origin is discovered. when the project would be profoundly changed! Similar efforts are going on in Europe, Canada, Australia, and the Soviet Union. (It is necessary to be careful when reading foreign reports; Soviet workers often use the term CETI where we would use SETI.) All these efforts date back to Frank Drake's pioneering Project Ozma in 1960, the first organized search for extraterrestrial intelligent radio signals.

Drake made use of an 85-foot radio telescope in Green Bank, West Virginia, for his work. The equipment used today is enormously more efficient than that used in Drake's original monitoring of the region near just two stars, Tau Ceti and Epsilon Eridani. However, most of the available wavelengths and sky regions still remain unstudied. As Frank Drake puts it, "The searches to date have been like trying to find a needle in a haystack by walking past the haystack now and then."

Interstellar Communication Using Neutrinos.

We have been emphasizing radiation as the right way to communicate. However, that is not the only possibility, and it may not be the best one. Radio frequency radiation penetrates dust and gas clouds well, so that we can, for example, use it to map the structure of our own galaxy; however, it has limitations. There are regions so dense that even radio frequencies will not pass through them. In such cases, we must look for another signaling method. If radiation will not work, it is natural to explore the potential of particles.

When we listed the desirable properties of radiation or particles for sending a signal over interstellar distances, we argued that anything with significant mass had two disadvantages: First, it would require lots of energy to accelerate it; and second, it could never travel as fast as radiation, which always travels at the speed of light. That argument seems to rule out particles, which usually

have significant mass.

But this leaves out one possibility. What about particles that have zero rest mass, and thus can (and indeed must) travel at the speed of light? Neutrinos are such particles.

The neutrino is a peculiarly elusive object, and correspondingly hard to deal with. It was predicted back in 1931, when the physicist Wolfgang

Pauli argued that we needed this particle to preserve the law of conservation of energy in subatomic processes. However, the properties assigned to the neutrino sound rather odd. The neutrino has no rest mass (or maybe a very tiny one—that is an important discussion going on today, and one that may decide if we live in an open or a closed universe). The neutrino also has no electric charge. So what does it have? It has a spin, and an energy that derives from its motion. But most important, from our point of view, is another property it possesses: The neutrino doesn't interact much with ordinary matter; thus, it can penetrate dust, gas, or anything else far better than other available particles.

That property was a nuisance when scientists were trying to detect the existence of neutrinos and thus confirm their existence. For example, a neutrino with an energy of motion equivalent to three times the mass of an electron would travel on average through 3,600 light years of water before it interacted with a hydrogen or oxygen atom. This is enormously farther than any other known subatomic particle. A neutron with the same energy of motion will travel on average only a foot or so through water before interacting with a hydrogen or an oxygen nucleus. This indifference to other matter on the part of the neutrino accounts for the long time that elapsed between the prediction that it should exist, in 1931, and its final detection by Reines and Cowan in 1953.

Given the difficulty of detection, it might sound hopeless to consider neutrinos as the basis for a communications system, except for two other factors. First, the probability that a neutrino will interact with matter rises rapidly as the energy of the neutrino increases. Second, an ability to pass through light years of obscuring matter is precisely what we were looking for. Given the penetrating property of neutrinos, it should then be no surprise to find that they also evade our detection equipment.

A couple of other complications should be mentioned. First, there seem to be several varieties of neutrinos (and their corresponding antiparticles). These are usually termed electron neutrinos, muon neutrinos, and tauon neutrinos, depending in which subatomic reaction they are created. More disconcerting yet, there is some evidence to suggest that these forms can change into each other, in ways that are still the subject of much theoretical discussion. Even today, more than 50 years after it was described, the neutrino remains a mystery particle.

Despite this confusion, the idea of using neutrinos for communication is already being taken very seriously. The Defense Department is interested in the possible use of neutrino beams to send messages to submarines, since all electromagnetic radiation is strongly absorbed by water. And a group headed by Robert Wilson, the founding director of Fermilab, has an even more audacious proposal. They suggest that neutrino beams produced by a particle accelerator could be directed right through the Earth, to give us an "X-ray" look at the planet's interior. As well as looking at the Earth's molten core, the same device, known as the "Geotron," would allow an analysis of structure closer to the surface—a possible new prospecing tool for oil, gas, and minerals.

Neutrino transmitters for use in CETI are at the limit of present technology. All we can say today is, yes, we certainly know how to create a neutrino beam. And if it were important to do so, we could also "pulse" the beam, modulating the intensity and energy of the neutrinos in the beam, over time, to produce a message-bearing signal. The message would pass easily through the center of the galaxy, unaffected by dust clouds, nebulae, stars, and plants it might meet along the way.

It would be expensive, but the prototype of any device is expensive. The neutrino radio is a plausible development for the next century, and a strong candidate for future interstellar communications.

#### Faster Than Light: Tachyons

From ET's point of view, every device we have proposed so far has one fatal objection: It permits messages to the stars to be sent at speeds only as fast as light. Since the nearest star is more than four light years away, ET would have a long wait before his friends could come along and pick him up. What we would like to have is a communication system that can send signals faster than light. And that takes us into rather deep waters.

In his original papers on relativity in 1905, Albert Einstein pointed out that his theory showed why any object traveling slower than light could never be accelerated to light speed, or to a speed

faster than light.

Many writers have interpreted this statement to mean that there cannot exist particles that travel faster than light, but this is not implied by Einstein's writings. As Sudarshar has remarked, it is as though a demographer were to assert that there can be no people north of the Himalayas, since none could climb over the mountain ranges!

In this case, the mountain range is the speed of light. Although a particle cannot be accelerated through that barrier, this in no way proves that particles cannot exist on the other side of that

barrier. Such faster-than-light particles may exist, and in 1967 Gerald Feinberg gave them their modern name: tachyons, from the Greek tachys, meaning swift. In the same way, particles traveling slower than light speed are known as bradyons, (from the Greek word bradys, meaning slow) and those traveling exactly at light speed are hazons.

One can argue that the first reference to tachyons was made over 2,000 years ago by Lucretius, in Book II of *The Nature of the Universe*. Writing about 60 BC., Lucretius spoke as follows about the invisible and indivisible particles he calls atoms: "Obviously therefore they must far outstrip the sunlight in speed of movement, and traverse an extent of space many times as great in the time it takes for the sun's rays to flash across the sky. No wonder that men cannot follow the individual atoms ..."

The idea of tachyons is one that has puzzled and frustrated scientists for a long time. Richard Tolman, as early as 1917, thought he had proved that the existence of tachyons would allow information transfer to the past, and thus allow the past to be changed. For example, a simple message back to 1963 could then in principle have prevented the Kennedy assassination—a possibility explored in detail by Gregory Benford in his splendid novel, Timescape. However, Tolman's argument is no longer accepted, and Benford's book remains as fascinating fiction.

Today, tachyons are regarded as permissible within the field of conventional physics. There seems to be no physical or logical law that rules out the possibility of their existence. This has led some writers, adopting T.H. White's rule of the anthill in The Once and Future King ("Everything the property of the control of the property of the propert

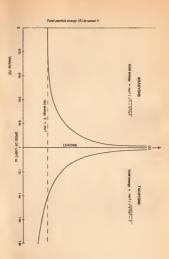
not forbidden is compulsory") to argue that tachyons must exist.

To see how light speed forms a natural barrier separating bradyons (the familiar particles of our universe) from tachyons, imagine that a particle is accelerated faster and faster in a particle accelerator. What happens to it? It certainly goes faster. but according to the theory of special relativity, as it approaches the speed of light, it appears to be more and more massive. As a result, it becomes more and more difficult to accelerate. Its apparent mass doubles, then quadruples-and still it is traveling slower than light. To accelerate it to the speed of light would take an infinite amount of energy.

In the same way, for a particle (a tachyon) moving faster than light speed, it takes more and more energy to slow it toward light speed, and it would take an infinite amount of energy to slow it to the actual speed of light. Thus, if both types of particles (bradyons and tachyons) do exist, then each must be confined to its own velocity regime. The speed of light is a "barrier" that forever separates the world of tachyons from the world of bradyons. One can never become the other

How, then, would one detect the presence of a

As a particle traveling with speed less than the velocity of light is accelerated, the energy needed to accelerate it becomes steadily higher. It would require an infinite amount of energy to accelerate it to the speed of light. Similarly, for a particle (a tachyon) moving faster than light speed, it takes more and more energy to slow it toward light speed, and would take an infinite amount of energy to slow it to the speed of light. If both types of particles do exist, each must be confined to its own velocity regime.



tachyon? It used to be thought that any charged particle traveling faster than light would emit a particular radiation (Cerenkov radiation); but this is no longer believed to be the case. The simplest possible way to detect a tachyon is probably through a simple time-of-flight test: If two particle detectors each register an event, and the distance between them is so large and the time of the events so close together that only a particle traveling faster than light could cause them both, then we have a candidate for a tachyon.

Of course, we must first be convinced that there is no other and simpler explanation. We would be witnessing independent events, nothing to do with each other, or they could perhaps both be the consequences of a third event. If two people in a household catch measles within a few hours of each other, that does not mean that the incubation time for measles must be only a few hours. They could each have caught the infection from a third person. And our "tachyon" event could be two separate consequences of some earlier event.

Do tachyons 'really exist? No one knows. Aware of the need for careful experiments, and the dangers of jumping to conclusions, experimenters are today engaged in the search for tachyons. Should they be found, their discovery will have an enormous effect on physics, and on our whole view of space and time. We will no longer be looking at a universe in which our knowledge is limited by the speed of light—which takes more than four years to the nearest star, 30,000 years to the center of our own galaxy, 2 million years to the Andromeda galaxy.

For 300 years, our ability to communicate more and more rapidly has been shrinking this world. But beyond the solar system, distances are so vast

that light-speed communication implies message delays of years, centuries, and millennia. Now it is perhaps time for the next step—in which tachyon radios change the communication scale of the whole universe.

And with their discovery, it is just possible that we will learn something else. We may find the answer to what is often known as the "Fermi Paradox." Enrico Fermi argued that if there are extraterrestrial intelligences, some are presumably more advanced than we are. Where are they? Why have we not heard from them? Every worker on SETI and CETI must have been troubled by these questions.

Tachyon communications suggest an answer. It may be that Earth is already bathed in a sea of tachyon transmissions. To any civilization that can pass the entrance requirement—development of the technology to capture the signals—there may come other rewards. Tachyon messages could carry the interstellar news and scientific knowledge that allows full membership in the galactic community, the federation of intelligence already occupied by ET and friends.

Where are they? They are there all right, waiting until humanity has grown up enough to join them.

# A STEP FARTHER OUT

#### Jerry Pournelle

If mankind is to survive, then throughout man's history except for a very few years the word "ship" will mean "space ship."—Arthur C. Clarke

In December 1984 we held the Fifth Meeting of the Citizens' Advisory Council on National Space Policy. The Council is a group of space scientists, astronauts, engineers, managers, entrepreneurs, politicians, lawyers, writers, economists, and a couple of selected space enthusiasts. The invitational meetings are supported by the Council members and supplemented with a grant from The Vaughn Foundation. We meet in the home of Larry and Marilyn Niven, and the Council couldn't exist without their aid.

The formal report of the fifth meeting will be published elsewhere. The Council reports tend to be bold but not daring; they are also unanimous.

As a one-time space scientist turned writer, I need not be so careful.

What you see below is unlikely ever to appear in a Council report; they are my own views reached after spending a weekend with a remarkably well-informed group of scientists, Congresspeople, retired military officers (generals and colonels) and science fiction nuts; with the people who could do the job, if only they were given the marching orders.

Council members have diverse views, and it's impossible to characterize them all. However, there are two major "factions" in the Council: those who believe we must go to space because of military necessity, and those who believe that we must go to space because of economic and social imperatives. During the fifth meeting for one magic moment it looked as if the space cadets and the military realists were one; but that was not to last.

The military realists are afraid that if we closely couple space defenses and economic investment in space we will get neither; and the United States will not survive.

The space cadets are afraid that if we do not invest heavily for the economic exploitation of space, the economy will stagnate as the government share of GNP grows more rapidly than the GNP itself. Soon there will be nothing to invest.

My own view is that if we as a free society—I will not here debate the proposition that on balance we still live in a free society—are to survive, we must have:

- · Strategic defenses.
- · Private enterprise in space.
- Government investment in space technology development.

Without strategic defenses the nation will not survive the next round of the arms race. MAD, Mutual Assured Destruction, argues that any measures taken to ameliorate the horrors of nuclear war makes that war more likely. This is not a view ever accepted by anyone but certain civilian defense intellectuals. Since you cannot halt improvements in technologies vital to military capability, a MAD strategy, by repudiating any defensive measures, accumulates ever more accurate and deadly offensive forces.

Thus, MAD leads us inevitably down the road to computerized launch on warning; a frightening world. A strategic defensive arms race can bring back some stability to the world created by MAD.

If the economy doesn't take a quantum leap we'll stagnate. It's just too easy to show "needy people," and too easy to make the argument that only government can do something for them. There is a vast army of civil servants who control an ever-increasing share of the nation's wealth; never in history has such an aristocracy voluntarily let go. Democracies endure until the citizens discover they can vote themselves largesse from the public treasury.

We have the capability to do both. To be specific: a Lunar Base and the Strategic Defense Initiative (SDI) will together cost less than the sum of the individual efforts. The best consensus we can get says that the two will cost about one and a half times as much as either.

A large space effort like SDI can, if conducted intelligently, stimulate private enterprise to develop lower-cost ways to access the space environment. Once free enterprise has low-cost access to space, the needed quantum jump in the U.S. economy will be inevitable. Space resources are new wealth.

It is also possible to do SDI in ways that do little

to benefit the economy. That must not happen.

The major challenge to America is productivity.

The space program can make dramatic changes in U.S. industrial productivity. In colonial times the founding fathers were keen on canals; they knew that providing access to the new frontier would more than pay for itself. Toll roads and toll canals were often built under government sponsorship and support.

The best investment we could make today would be to lower the cost of access to the space environment

This can be done simply if we really want to do it.

ORION, affectionately known as Bang, Bang, uses nuclear fission/fusion bombs to launch and propel a large spaceship. We could, with a single ORION, put a four-million-pound base on the Moon. This would be more than enough for a self-sustaining colony.

At the same time, we could begin development of ground-based laser launching systems. Electric power for those lasers could originally come from nuclear power plants, were it not for our national nuclear phobia. A more expensive—but certainly feasible—alternative is space-based solar power satellites. These satellites can be placed in orbit, or at the Lunar poles.

Once electric power flows from space, laser launching systems will drastically lower the cost of space access; an economic spiral whose maximum output cannot at present be calculated would begin.

Economics and investment are boring subjects.
We need to talk about it, but economics has little
power to stir the blood. Large goals and large

dreams electrify the people. Where there is no vi-

sion, the people perish.

The return to the Moon is such a dream. Unlike the space station—which remains necessary—the establishment of a Lunar settlement, permanently inhabited, has the power to draw the people toward it.

It is also an investment. Large returns on that investment are as certain as returns on any invest-

ment have ever been.

The first elements of a permanent Lunar Settlement—preferably a Pan-American expedition could be set into place in the year 1992. The effect on U.S./Latin American relations would be profound.

In that same year we could also have in place the first elements of High Frontier. Not just research: we could deploy key elements of the strategic defense of the United States and most of our Allies.

#### Beyond the Millennium

Congressman Newt Gingrich is an historian. As he is fond of saying, millennium years are rare.

Surely the United States of America can, in the year 2000, make an unambiguous contribution to the future of mankind.

I suggest the Lunar Settlement: that the first elements land in 1992; and that by the year 2000 Luna City can be completely self-sufficient, capable of keeping humanity alive no matter what, war or dinosaur killer, might befall the Earth.

By 2004, anniversary of the Lewis and Clarke Expedition, we could land the first elements of a permanent settlement on Mars.

permanent settlement on Mars

These are not dreams. The engineers, scientists, and managers who would have to do the work all agree we can do it, and at prices we can afford. At

present the United States annually spends \$200 billion more than it takes in. Any family attempting that trick would be bankrupt in no time. Even a land as rich as we cannot forever saddle our children with the bill for our wild party.

Yet for far less than the current deficit—for perhaps \$25 billion a year, certainly no more than \$50 billion a year—we can insure the survival of our children, while simultaneously developing the technology and resource base that will pay off the terrible debt burden we have already placed on their shoulders.

We can do both. The key to both economic health and strategic defense is space. Whatever we do in the space medium advances both goals. We know how to do the job. Intelligent planning—intelligent use of the space media—will, if we'll only do it, bring in a new era of

Peace Prosperity and Freedom.

### EDITOR'S INTRODUCTION TO: SPACE SHUTTLE CRASHES!

by Thomas Wylde

Thomas Wylde has written often about everyday life in the future.

Man in space can be free. Free to be an idiot.

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SHUTTLE CRASHES!

Before the astonished eyes of half a million spectators in the desert, and countless millions of television viewers, the space shuttle banks into final approach configuration, its path bringing it inexorably toward a collision with an immense array of salvaged solar panels that has been erected less than a mile from the concrete runway.

For a moment the vast crowd is hushed.

Then, as if with one excited voice, the mob roars.

#### IMPACT "It's phase-shifted," the supervisor said.

"Ah," said Arthur Adams.

"Check it out. I'll be back in half an hour."

When the supervisor left, Adams floated for a long moment in front of the equipment cabinet. He thought: I wonder what the hell this thing is?

Probably some sort of computer. That's what he signed up for: computer repair and space welding. Somewhere on Earth there was a real technician scratching his head over a computer-generated letter of rejection. (And they say computers can't be bribed.)

He drifted to a porthole and looked out. The Earth was huge, blue and white, tinged with yellow pollutants. Just gorgeous. Whatever it had taken—the lies, the bribes, the years of waiting—it had all been worth it.

He stroked the cold, smooth metal of the porthole rim. It saddened him to think it was all coming to an end. This station—the last one fully operational—would soon be abandoned. Probably . . .

(He'd heard about a gang of space-happy saucer folk—the Crazies—who wanted to build a space port at L4 to lure UFOs down to solve Earth's problems.

(The Doomsters were against it, naturally. They wanted God's plan of Holy Destruction to come full circle. Let the starving, poisoned, sinning masses collide in senseless slaughter. On to Judgment! Their lobbies and boycotts had just about ended the Space Age.)

He heard a tiny noise and turned, saw a stunning blonde drifting past, looking at him with curiosity. Adams smiled. She nodded vaguely, and

disappeared up a corridor.

This place had all sorts of stuff going for it. If he

could only keep his job . . .

Adams pushed off from the window and stationed himself in front of the machine. Phase-shifted, el? Maybe it was a problem that could be spotted visually. Surprising, the number of high-tech problems that owed their mystery to an unplugged coupling or a wire yanked off while dusting.

Adams peopled a latch and swung the front panel

open. Every light on the console went out.

Ah, he thought. The door's interlocked to the power circuit. Interesting.

He plugged in a trouble light and peered into

the interior of the bay. What a tangle! "Hey!" said a voice behind him. Adams banged his head jerking out of the cabinet, then rebounded face first into the computer (if that's what it was). A hand grabbed his neck and yanked him out. The supervisor. "What the hell do you think you're doing? I said it was phase-shifted, not crenelated."

"Oh."
"Where's your logoscope? Your Krempt probe?"

"Excuse me?"

The supervisor stared at him for a moment, then grinned. "But it's a hell of a view from up here, ain't it?"

"Sure is!"

"Gonna cost you plenty, though."

"Uh . .

"Twenty-seven thousand dollars. I'll just make sure there's room on tomorrow's shuttle. And arrange for a little reception at the Cape."

"But the, uh, computer here-"

"No, no, don't you worry about a thing. I'll get a tech to shoot this little problem for you. I don't want anybody to think we make our paying guests work. Why don't you just take a break? Look out the window. It's marvelous, simply marvelous!"

"Yes," said Arthur Adams. "A dream come

rue....

Twenty-seven thousand bucks worth.

## EARTH STATION THREE—4 HRS 2 MIN TO IMPACT

Bissel wedged himself in front of the phone terminal so he wouldn't float away while he talked to his assistant in Palmdale, California. "We're all set at this end," said Bissel. "The shuttle's at dock ten, right on the end, so there'll be no problem getting away from the station."

"We still see retro in just about three hours." said Dell. "That should put you on the ground in

four hours."

"As advertised," said Bissel. "Then I'm going to go get hammered and sleep for a week. You can't believe the hassles these guys have handed me. It's not as if—Wait a minute."

The station director had just propelled himself into Bissel's temporary office. Bissel didn't like the

moronic look of pleasure on his face.

"You're cancelled," said the director, fighting his smile. "That shuttle's not going anywhere."

Bissel turned to the phone camera. "I'll call you back."

Dell looked worried. "Retro in three hours." "Yeah "

#### EARTH STATION THREE-3 HRS 48 MIN TO IMPACT

Arthur Adams drifted down the corridors of the station, pausing from time to time to glance out a porthole. He couldn't concentrate on the view. It was no fun knowing how much it was going to cost him. And they were going to meet his shuttle tomorrow. When they found out how much money he had in the bank, they'd probably haul him away in chains.

Adams moped along a docking tunnel, passing the widely spaced airlocks that radiated at all angles. Most of them were closed, red lights winking. Those hatches wouldn't open if you yanked on them, not unless you had the key. Adams stopped and looked inside one through the port in the hatch. The airlock was dark and empty, and the outside door was closed.

A big guy in a NASA t-shirt sailed down the corridor, smacking him on the butt as he passed,

"Nice try."

Adams smiled weakly and drifted on. At least they hadn't locked him in a cabin somewhere. Oh.

yeah, he was a guest. Honored guest.

He came to a stop at the end of the corridor. The lights around airlock ten were green, the airlock chamber lighted, though empty. Beyond the second-outside-hatch was a docking collar and the hatch of a shuttle, dimly seen. Adams paused outside the airlock and looked up the corridor, All alone. His eyebrows lifted.

He'd been told tomorrow's shuttle was still on the pad at Kennedy. That meant this shuttle was pulling other duty. Lift to synchronous, maybe, Or drop to Vandenberg—and that meant Air Force. Maybe it was one of the few private shuttles still

in space after all the boycotts.

The corridor was still empty. Adams gripped the handle on the inner door, yanked it down. Inside the thick hatch a dozen dogs retreated from the jamb, smooth as nylon. The door hissed the tiniest bit, then swung forward into the corridor. The lights changed to amber.

Adams quickly jumped inside the airlock and swing the door shut. He put his face up against the glass and made sure the lights had gone back to green. Good. Now a casual glance down the

airlock corridor would reveal nothing.

In a few seconds he was in the docking collar, and the outer airlock door was closed behind him. The collar-was cold, and his ears popped. For a hideous moment his mind ran a nightmare past his eyes: the shuttle hatch was locked, and while he fiddled with it the pressure in the docking collar dropped so low the outer airlock door refused to open. Maybe in a few days they'd find him dead in the collar, frozen, desiccated, his juices dumped to yacuum

But the shuttle hatch seal cracked immediately and a moment later he was inside. It was dark and hot in there, and his ears popped again when he shut the hatch.

"Anybody home?" he said, not at all loudly.

### EARTH STATION THREE—3 HRS 42 MIN TO IMPACT

"This is ridiculous," said Bissel. "You waste twenty minutes telling me a lot of dreck why I can't have that shuttle—twenty minutes! And you know I'm on a tight schedule. Then you finally let loose of the real reason." The station director was slowly bouncing himself back and forth from one side of the cabin door to the other. "There are many technical reasons for—"

"Bull," said Bissel. "The bottom line is, you guys wanna jerk my credit around. You know damn well the transfer is going through right this minute in Hamburg and Houston."

"Money is not my department."

"My friend, you're walking on thin ice."

The director looked at his feet, which were floating inches from the deck. "No problem."

### SHUTTLE THREE-TEN—3 HRS 41 MIN TO IMPACT

The shuttle seemed deserted. There was just enough emergency lighting on the mid deck to find the light switch. What Adams saw then astounded him.

The shuttle was stripped. Half the electronics bays were open and empty. The whole cargo bay control panel was missing, and the lock hatch was open to the transfer tunnel. Nuts, bolts, and bits of brightly colored wire floated everywhere, drifting on the currents of the (thank God) operating air conditioning system. Adams felt as if he were inconditioning system. Adams felt as if he were inhibited one of those paperweights with the phoney blizzard. He popped himself onto the flight deck.

Gutted, stripped, empty. This shuttle was a skeleton.

"My kind of ship," murmured Adams.

## EARTH STATION THREE—3 HRS 8 MIN TO IMPACT

"The whole show is up in the air," said Bissel into the camera. Dell, in Palmdale, nodded. "I got the lawyers working on it, but it'll be close."

"We got to fire those retro-rockets in two hours," said Dell. "Plus maybe one hour, tops. Folks will get mad. And if you have to reschedule, you know you're going to lose some of them. And the money—"

"—is all but spent," said Bissel. "I know, I know."

The speeding space shuttle penetrates the solar panels without slowing, as chunks of silicon and metal explode into the air. Fragments of the shuttle near the cockpit rip upward and are still ascending when the high pitched sound of the crash reaches the breathless crowd.

## SHUTTLE THREE-TEN—2 HRS 59 MIN TO IMPACT

Adams drifted about inside the gutted shuttle. The view out the back window, the one leading into the cargo bay, was dark. Apparently the bay doors were shut. That explained why the shuttle was so hot inside. There were heat-radiating panels built into the door of the cargo bay. Though stripped, the shuttle's systems still operating produced heat but had no way to dissipate it. Fortunately, with no crew members aboard, and operating at low power, the shuttle cabins were not unbearable.

Adams climbed into the pilot's seat and looked out the forward ports. All he could see was black space, and a few stars cutting the glare.

My first and last look at space, he thought. He'd never make it back. He knew that. He was

32, full of ideas and bravado—but no marketable skills. Younger, smarter men were coming up behind him, pushing him aside.

Back to McDonald's, he thought. Back to the microwave grill and the fifty gallon jugs of soy oil.

Back to the damp mop and the dirt burner. Great. What a life.

I might as well be dead.

Floating in freefall, gazing at the stars of black space, Adams began to feel the chill of death. What was the use?

A hand gripped his shoulder, almost warmly and a woman's voice said, "Where's your equipment?"

It was the blonde. "Beg pardon?" he said.

She backed off. "Who are you?"

Then they both turned as a mean-looking guy poked his head through the floor hatch.

"Get the hell off this ship!"

## EARTH STATION THREE—2 HRS 40 MIN TO IMPACT

"Can you imagine that?" said Bissel into the camera. "They found this guy in the pilot's seat, like he was figuring on going for a ride."

"Some ride," said Dell, grinning. "How's this credit business coming?"

"Slowly," said Bissel. "And we got go/no go com-

ing up in seventy minutes."

Dell frowned, shaking his head slowly. "It's going to be close, old buddy. But this is the part that separates the men from the lunches."

"You space guys talk so cute," said Bissel,

Behind Dell, on the wall of his office—and clearly visible in the phone transmission to the space station—was one of the beautiful posters that were plastered all over ten dozen cities. The picture showed a gleaming space shuttle headed straight down toward a big red bull's-eye on the ground. SPACE SHUTTLE CRASHES! the poster announced, somewhat optimistically. They'd hoped to acquire at least two aging shuttles and stage a full card of

crashes, perhaps even including the explosive spectacle of a midair head-on collision—but the money ran out. Maybe next time.

As for this time: well, the tickets were sold, the crowd packed into the stands in the desert, the precrash show was going to begin in little more than an hour, beamed to pay-television sets all around the world. Everybody was eager to witness the spectacle.

All Bissel needed now was *one* shuttle for the purposes of show business destruction.

And he was damned if he was going to refund a dime to anybody!

Shuttle three-ten blasts through the last of the solar panels, trailing a flurry of wreckage, and heads directly for a large prejab building. On the side of the building is an enormous red bull's-eye, and the shuttle is right on the money.

### EARTH STATION THREE—2 HRS 0 MIN TO IMPACT

The "slammer" on earth station three was a padded closet two by two by eight feet. There was a directible cool air nozzle in the ceiling, and a five inch viddy screen mounted in the wall two feet lower. If you wanted to go to the can, you had to ring for someone to take you. They told him there were three such closets on the station, all brand new—never been used. "You're the first space criminal," they told him.

"I'm honored."

Adams had already been in there for half an hour. He got tired of the air hitting him on the head, so he inverted himself and cooled his feet for a while. Of course now the viddy screen was opposite his shins and the image—a noisy John Wayne western—was upside down.

This place needs work, Adams thought.

Had things worked out, he would have flooded the engineering department with suggestions for redesign. But then, if things had worked out, he never would have seen the inside of the slammer.

Adams wiggled his toes in the air stream. After they yanked him off the shuttle, they told him he'd made a bad choice of transportation. They said it was a private shuttle, all right, but that it probably wasn't going anywhere. Legal problems. It had been scheduled for an 1830 exit, but everything was in the air right now. There was something else about the shuttle they weren't telling him, if anything could be inferred by the way they smiled and rolled their eyes. He hoped it wasn't important.

Adams reached out with his foot and toed the time stud on the viddy controls. Reading upside down, it was almost 1800 UST.

Well, nothing ventured . . .

Arthur Adams buzzed for a latrine call.

Time was running out.

## EARTH STATION THREE—1 HR 47 MIN TO IMPACT

"We got it!" said Bissel.

The station director smiled faintly. "So I've been notified."

"You release the shuttle to my control?"

"Absolutely. And by the way, our salvage operation is complete."

"As long as it flies and answers to the radio-pilot."

"It will."

Bissel continued to grin. The sense of relief was staggering. He hadn't dared to admit to himself what would have become of his career in show business had this deal conked out on the launch pad, so to speak. But now his mind was racing. "This is just the first one, you know. I'm sure we can put together another crash package."

The director shrugged. "Maybe so. We got four more shuttles headed for salvage in the next year

and a half. It's the end of an era.

"Yeah, well don't blame me," said Bissel, "Hey, you know they used to do this with old locomotives. I've seen the film—great head-on crashes, full of steam and exploding metal. That's how I got the idea. Your average goon just loves to see things blown up. If this deal works out you better believe we got our eve on those other shuttles."

"It all depends," said the director, "on who bids highest. And if you crash folks make a killing, the price will quite naturally go up. Right?"

Bissel's grin faltered a millimeter, "We'll see,"

## SHUTTLE THREE-TEN—1 HR 38 MIN TO IMPACT

Adams scrunched down in the empty shuttle equipment cabinet in the dark. From the sounds that began less than five minutes after he'd come aboard, he was sure now the shuttle was going to exit the station at any time.

What luck!

They'd told him it might not go at all. He guessed some smart lawyer had straightened out all the legal problems—as usual. Right now Adams even had kind thoughts for lawyers.

The sounds diminished, then he heard what had

to be the hatch sealing. His ears popped.

The shuttle was silent for a full minute, obviously deserted—the shuttle to be flown by auto pilot—when his ears popped again. He heard voices.

"Then he never made it up here," said a man.

"Son of a bitch," said a woman. Adams recognized the voice. It was the blonde.

"That's it," she said. "We're screwed. Without

that jamming equipment—"

"I don't understand what happened to him."

"That bastard Adams got his seat somehow."
Adams held his breath. His little computer trick

had apparently bumped somebody of importance.
"We're screwed," she said again. "If I can't reori-

ent the shuttle before the retro, it'll drop like a rock."

"Come on, we'll try again next time."

"It was Adams," she said. Her curse was occluded by the slamming of the hatch and the popping of his ears.

He floated in the silent darkness, hardly breathing.

The way she sounded, he was glad to be getting off the station. It might not be safe hanging around.

He had messed up some plan of hers, something to do with turning the shuttle before the retroburn. If she did that, the shuttle wouldn't re-enter the atmosphere. It would head out to a higher orbit where—my God, they meant to steal it!

What if they were working for the Crazies? Now he really was glad to be getting out of there.

The shuttle jerked, and Adams banged his head inside the equipment bay. They were exiting the station!

Adams made up his mind and cracked the door on the cabinet. The crew shack was dimly lit, but he could see it was deserted.

He uncoiled himself from the cabinet and floated toward the flight deck. He paused in the hatchway, braced to run. Everything was fine, dark, and empty. A light or two winked on the control panels, but the ship was deathly quiet. Another shudder rocked him in the hatchway.

Adams waited another minute. His knuckles still smarted, and his cheek, too. He hated having to hit that guy. And he hated even more getting hit back. But hell, he was a desperate man. No real harm done. And he was on his way, finally,

Thank God.

The nose of the shuttle smacks the building within inches of dead center of the bull's-eye and disappears inside. The flimsy building was designed to allow the shuttle to stay hidden for a fraction of second. Now the nose of the shuttle pokes out the other side, its speed hardly diminished, the wood and foil of the mock building flying in all directions. What a glorious sight!

The crowd roars approval.

#### EARTH STATION THREE-1 HR 2 MIN TO IMPACT

Bissel floated deliciously in front of his telescreen, listening to the count-down. The crash program was on the air. In two minutes the retrorockets would fire and the shuttle would begin to de-orbit. Right on schedule!

The station director poked his face in.

"Have a drink!" said Bissel.

"He's missing," the director said. "We're searching the station now. Just wanted you to know."

"Who's missing?" said Bissel, "Sure you don't have time for a drink? It's a big day!"

"That guy we found hiding in your shuttle," said the director. "He beat up one of my workers and locked him in the latrine."

"How long has he been missing?"

But the director was gone, pushing off down the corridor.

"Hey!" said Bissel to the empty doorframe.

He turned to the screen. Twenty seconds to retrofire-all systems on automatic.

It's not possible, he thought.

Then he jumped from his chair and darted after the director, "Wait a minute!"

SHUTTLE THREE-TEN-1 HR 1 MIN TO IMPACT

The shuttle was flying upside down and backward. It seemed to Adams as if the Earth was retreating over his head. He had strapped himself into the pilot's seat and was just getting comfortable. He had to keep telling himself that nobody was going to come up behind him this time. He was genuinely alone up there, drifting along over the Indian Ocean at what looked to be about local midnight.

It was so quiet and peaceful.

Must be downtime for the fans, he thought suddenly.

But then he realized he'd been in the shuttle for half an hour and it had always been this quiet. The fans were off, permanently. The air system was shut down.

Of course! The autopilot wasn't going to complain if it got a little stuffy on the way down. It wouldn't squawk if all the air turned to carbon dioxide!

Adams was instantly aware of his every breath.

How much air have I got?

It all depended on when the shuttle came down. If, for instance, more legal problems cropped up, the shuttle might take a week to re-enter. Or a month. It made no difference to the shuttle.

Adams stared at what remained of the controls.

Would it be possible for him to fire the retrorocket from here? It might take a day to find the right switch. And the duration of the burn was critical. The idea was to slow the shuttle a precise amount. He'd have to know—among other things—the thrust of the rockets and the mass of the shuttle. Precisely. It was honcless.

He'd just have to rely on the automatic system to get him on the ground before his air ran out.

Adams relaxed in the pilot's chair,

A measure of calm came over him as he realized he was to be merely a spectator in a life-or-death debate that showed up on the panel of the control board as a silently flashing light.

I'm in the greasy lap of the gods, he thought.

Have patience.

And immediately the shuttle jerked, and he found himself pressed into the cushions. Retrofire.

Hallelujah!

### EARTH STATION THREE—0 HR 31 MIN TO IMPACT

Bissel watched helplessly as station crew members flitted up and down the corridors, shouting negative reports. The man was nowhere to be found.

Bissel spotted the guy who'd told him about the stowaway in the first place, "Hev!"

"I'm busy!"

"Tell me one thing! Are you sure you guys told him what we had in mind for the shuttle? Are you sure you made it clear it was going to crash?"

The guy shrugged. "I don't remember. Probably." He smiled weakly. "I'm pretty sure. . . . "

Bissel let go of the man's arm.

"That's it," Bissel muttered. "He's on the shuttle."
And with my luck he'll do something crazy in

there and crash the damned thing in the ocean, and no one will ever see it.

For a moment he watched the scurrying station

folk.

"C'mon, God!" he yelled. "You call this fair?"

### SHUTTLE THREE-TEN—0 HR 16 MIN TO IMPACT

Arthur Adams sat up straight in the pilot's seat. The sweat kept streaming off his face, despite the cooling fans that had come on—scaring the hell out of him—during the heat build-up of re-entry. Strictly for the protection of solid-state guidance

out of him—during the heat build-up of re-entry. Strictly for the protection of solid-state guidance equipment, he knew. He was still too nervous to tell if the air was going bad or not. The events of the last few minutes swamped his mind.

After the retroburn, the shuttle—which had been

flying backward and upside down—dropped its nose and did a slow flip until it was facing forward and rightside up. They passed to the left of Australia, smooth and light, as if nothing were coming up. But then the bite into the atmosphere began to tell.

High over the Pacific the shuttle lifted its nose and began ploughing through the thickening air. The heat tiles of the nose glowed cherry red.

That was when the fans suddenly cut in. Adams had been too busy sweating nervously to notice

the increased heat on the flight deck.

Then the glow dimmed and went out, and when the nose of the shuttle came down and he could see again, he was maybe thirty miles up, approaching the coast of California.

"Yea!" he yelled. "I'm going to make it!"

Shuttle three-ten blasts its way out of the target building and drives full tilt toward the mountain of

sand that has been bulldozed together to serve as the final barrier. The shuttle is not expected to make it through the sand mountain.

#### EARTH STATION THREE-0 HR 11 MIN TO IMPACT

Bissel was screaming into the phone camera at Dell in Palmdale, "For God's sake, do something, He's on that shuttle!"

"Are you sure he's not hiding on the station?" "Yes!

"Really?" "No!" said Bissel angrily. "But if he's on that

shuttle and we don't at least try to save him, his

family will sue the pants off us! Dell was looking off camera. He nodded to somebody and turned to face Bissel. "Just crossed the coast. He'll be down in ten minutes, one way or another "

"You're controlling the flight!"

"Not directly. There's computers on the line. We can take control, but we'll lose the computers forever. From then on it's fly-by-wire. So we better wait until the last minute to grab the stick.'

"Okay," said Bissel, "We wait, then we take it.

Then what?"

"We land it at Palmdale."

"Land it?! Those people didn't pay ten bucks a head to see a shuttle land. They get that twice a

month for free. We're talking crash, pal."

"Yeah, I know. I saw the posters. But you said do something. Or was that just a statement for the press? 'Yes, sir, we're doing everything we can.' that sort of thing."

Bissel's brain was racing. He saw his careerwhat there was of it-exploding over the California desert in lieu of the real thing. "You can't just land it. We don't know for sure he's even on the damned thing, NASA copped the radio.' "So what do you got in mind?"

"You guys hash it out at your end. You got ten minutes to-"

"More like eight."

"Fine, Kick it around and-"

"I think we ought to get NASA in on this. Those

guys know the shuttle a lot better than-"No!" said Bissel, "The way they jerked me around? No way, José. Let's keep this business in

the family. Get on it now and get back to me.' "Okey-dokey."

#### SHUTTLE THREE-TEN-0 HR 6 MIN TO IMPACT

Adams cinched his harness tighter. The shuttle was coming out of some wide S-curves over the central valley. It seemed to be on approach to Southern California. Maybe it belonged to Disney Corp. It didn't matter. He figured it would be on the ground in five or six minutes. He'd have to be ready to run for it. He took a deep breath. Everything was going to be fine.

#### EARTH STATION THREE-0 HR 3 MIN TO IMPACT

Bissel stared at the empty telescreen. There was a certain bleakness in his approach to life, coupled with a kind of mad hopefulness. He kept thinking somebody would poke his head into the cabin and announce, "Oh, you know that guy we were looking for? Found him in the galley making a peanut butter sandwich. You know what he said? It was the funniest thing-"

"Bissel?" said Dell, his image forming on the screen.

"Go."

"We're taking control in one minute, and I think we got a way of saving the guy. But we'll need some luck. If he's strapped himself into one of the command seats, either the commander's or the pilot's, we'll use the seat ejector and shoot him a couple hundred feet in the air. It's all automatic after that, chute and everything. Now I'm not saying the guy might not get his feathers ruffled, but—"

"Do it!"

"Are you watching the show?"
"The show? Oh, hell, I forgot!"

"Amazing."

"Just do what you have to. Stay on the line. I'm

switching the video to the show.

Bissel touched the switch. The picture was beautiful. The gleaming shuttle dropped toward the desert in the shimmering noon air, captured by the camera of a chase plane. There were eight cameras in the operation, some of them ultra-highspeed slow motion rigs that would make the most spectacular instant replay in history—as well as the basis for the free two documentary that nobody, but Bissel knew about right now...

It also occurred to him those fine, sharp, agonizingly slow motion images might document for a court trial the negligent murder of one Arthur Ad-

ams, amateur space enthusiast.

The shuttle wobbled a bit, its nose dropping and rising for one heart-throbbing moment.

They must have taken control, thought Bissel.

Here it comes, the big gamble!

Now that he thought about it, the blasting of the ejection seats would add a bit of a thrill not in the program. Great!

As long as it worked. But why wouldn't it? The equipment was standard, perfected, absolutely reliable. "Dell!"

"I'm busy!"

"Suppose they salvaged the ejector packs?"

"Oh, hell!"

SHUTTLE THREE-TEN-O HR 1 MIN TO IMPACT

Something's wrong! The shuttle was lining up to the right of the runway. There were things in the way. A huge array of sparkling panels built high in the sky, and beyond that a goddam building with—oh my God—with an immense red bull's-eye painted on it!

Sweet Jesus, thought Adams. These people are crash crazy!

Instantly he was out of the pilot's seat and diving across the flight deck, away from the awful crash to come. In a sickening crush the shuttle penetrated the panels, hardly quivering. One more step, and he dropped heavily through the floor hatch onto the mid deck.

There were twin explosions immediately after, and Adams popped up to gawk at the holes in the cockpit roof. Abruptly both front seats blasted out of the shuttle on plumes of smoke and fire.

Adams turned and vaulted across the mid deck and into the airlock that led to the cargo bay. He only hoped it would be strong enough.

Bissel watched the ejector seats are into the air as the shuttle emerged from the wall of solar panels—"Thank God they worked!"—and instantly heard Dell's voice yelling on the line: "They're empty!"

"He's not on the shuttle!"

"We don't know that. I'm going to have to try to land it!"

"No!"

The shuttle is almost on the mountain of sand when it pitches its nose into the air and begins to gain altitude in painful slowness. It smacks the sand near the top and bounds into the air with a horrible scraping noise. Immediately it begins to bank toward the concrete runway that parallels the line of its intended crash. The landing gear doors gape open and the gear descends, mere sticks without-

"Wheels!" screamed Bissel. "Those bastards stole my wheels!"

"It's called salvage," said Dell. "They weren't essential to your plans, remember? So you saved a few miserable bucks.

Bissel watched the screen. The shuttle cornered the field at Palmdale International.

"Maximum white knuckle," said Dell, his voice soft.

The shuttle swung around and lined up on the runway. It was eighty feet high, balanced at stall. nose up, the sticks of its landing gear naked and threatening.

"Raise the gear!" yelled Bissel. "They'll tear up

the runway!" "They'll eat some kinetic energy on the way," said Dell, "Worry about the bills later."

After that it all went very quickly. The shuttle dropped to the concrete and dug in, scraping along in a scream, straight and hot until one strut dug in too hard and the shuttle went sideways and began to arc toward the grandstands. Then the leading strut broke and the shuttle leaned, started to roll, recovered on the stub of its crushed port wing, slid on its side, and slammed backward into a pair of parked fire trucks. The impact loosed the cargo bay airlock, which ripped its way out of the top of the shuttle and skidded along the runway in a shower of sparks, coming to rest right in front of the stunned crowd.

As the demolished fire trucks and the remains of the shuttle blazed harmlessly to one side. Arthur Adams popped the airlock hatch and crawled out, blinking in the sunlight, deafened by the sudden roar from the crowd. He had the presence of mind to bow deeply, then wave to one and all. They went crazy.

"I will personally kill that son of a bitch," said Bissel. "If he won't sign up for the next shuttle crash."

Arthur Adams sat alone on the bed in his Vegas motel room. He was drunk. On the wall was a souvenir poster:

SPACE SHUTTLE CRASHES!

He leaned over and stared dully at the new cowboy boots on his feet. Stuck to the bottom of one with a wad of purple bubble gum was page three of the contract he'd signed with Bissel.

"Big bucks," he muttered, then flopped onto his

back on the bed. The ceiling was crawling.

He'd held out for \$27,000 for his first scheduled crash, to occur sometime next month. At least that got NASA off his back. But now he was broke again, and there was a pair of mean-looking geeks sitting in a rented Buick across the street that followed him everywhere. Bissel was protecting his investment.

Adams groaned.

He'd got out of the first crash with a few bruises, a sprained wrist, and one hell of a headache. He might not be so lucky next time.

Sure, he'd be getting back into space ... for a few hours. But was this really the best way?

Maybe he ought to check out the Crazies. At

least they were trying to do something.

Then he remembered the blonde and her opinion of him. Perhaps the Crazies weren't so safe after all.

Adams took a deep alcoholic breath.

Okay, figure it this way: If he lived through another crash or two he might get a few bucks ahead. After all, there were only so many pairs of cowboy boots a guy could buy, and so many thrilling, chilling nights in Vegas a human being can endure.

Might get famous too. Market an Arthur Adams action doll, maybe a self-exploding model. His picture on bubble gum cards. A spread in People magazine.

A spread on the landscape of Bloody Desert. Arthur Adams sighed. The ceiling was still crawling.

'What are you trying to tell me?" he whispered. Then he saw it was telling him a joke, and the punchline went: "What, and give up show business?!"

## EDITOR'S INTRODUCTION TO: THE LEADING EDGE

#### by Roland Green

We had always intended Richard E. Geis as the book reviewer for this magazine. Alas, unexpected difficulties have made that impossible

difficulties have made that impossible.

I am pleased to introduce Roland Green. I first met Roland when he held a small room party at DISCON, the Washington, D.C. World Science Fiction Convention. I confess that at the time I had never heard of him, but that was soon remedied. Among my many vices is a passion for historical data, both profundities and trivia; and in Roland I found a fellow soul.

Since that time we have collaborated on Clan and Crown, Book II of the Janissaries series, and have finished a goodly part of Book III. I look forward to working with Roland for some years to come.

## THE LEADING EDGE

Book Reviews by Roland J. Green

Dick Geis has had to drop this column, so John

Carr volunteered me as a replacement.

Like a good many professional SF reviewers, I'm both a reviewer and a writer. I've been trying to fill A. J. Budrys' shoes at Booklist Magazine (a publication of the American Library Association) and the Chicago Sun-Times for several years. I may even have succeeded, although A.J.'s are large shoes; he is undoubtedly the best critical mind the SF field has yet produced. Now, for the first time, I'm addressing a national audience of people whom I can assume know something about SF, and anyone who doesn't think that's a pleasure can try communicating with someone entirely outside the SF community for a while. Science fiction is no longer an isolated tribe whose mores and customs are as strange to the man in the street as those of the Ulungabunga of Hither New Guinea, but we're not exactly out in the full light of day, either.

I'm also the author of the four Wandor fantasy novels (and yes, there will be a fifth one), and co-author of three Ace paperbacks: Janissaries: Clan and Crown (with Jerry Pournelle), Jamie the Red (with Gordon R. Dickson), and Great Kings' War (with John Carr; a sequel to H. Beam Piper's Lord Kahan of Otherwhen). So I've written both SF and fantasy, and acquired a perspective on both from both sides of the typewriter.

This carefully cultivated form of schizophrenia has left me with a few idiosyncracies, most of which will become obvious in the course of the column. One I want to put on record now: I don't do killer reviews. I won't limit myself to books about which I can say only nice things; no book is that perfect. Nor does the fact that I don't cover a book mean that I didn't like it. I have only so many hours in my day, and Far Frontiers has only so much space to give to reviews. I have to pick and choose, and I'm even less perfect than the books.

However, any book that sees print represents an author's commitment, if not always of his heart's blood, at least of a fair amount of his time. I get no pleasure from telling him in public that he's wasted his time, and as for people who derive pleasure from such an unnatural act, to quote James Thurber, "I am unable to associate with them long enough to find out what goes on in their minds." The author of even the most rancid book is like a derelict lying in the gutter—if you can't do anything for him, at least have the decency not to shove him deeper into the muck.

End of sermon. On to the books—a random selection of volumes that have stuck in my mind as worth bringing to people's notice. I won't claim it's a particularly current selection, either; this column is being written just before New Year's of 1985 and will be read around Labor Day. (Would the editors object to changing the name of the column to "The Trailing Edge"?)

Larry Niven, *The Integral Trees*. Del Rey/Ballantine, \$14.95 hardcover/\$3.95 paperback.

Niven's latest book explores a human society that has evolved in a zero-g environment, the torushaped ring of gas around a neutron star. The star's gravity field has compressed a good part of that gas to a density that has allowed life to develop, including a variety of exotic and formidable predators and the hundred-mile-long integral trees of the title.

Into this environment come mutineers fleeing from a State slower-than-light vessel, a mixture of live humans and revived corpsicles. After a few centuries, the survivors have fragmented into a number of small societies, who have fallen out of contact with each other and mostly forgotten their origins.

In the settlement called Quinn's Tuft, the water supply and the game are failing, as their tree's orbit carries it into a thinner, drier part of the gas ring. An expedition starts up the Quinn's Tuft tree in search of new supplies of food and water. They meet a war party from another tribe, and the survivors of both parties suddenly find themselves adrift when the tree itself disintegrates under gravitational stresses.

Further adventures bring them to a group that has maintained a fairly high level of technology, and even kept operational one of the starship's exploration modules. Capturing that module and some of its crew, the oddly assorted pioneers take it far enough outside the ring that for the first time in centuries the gas-ring settlers have some

clear idea of where they are.

That is the end of this book, but by no means the end of the story; The Integral Trees is the first half of what was originally intended to be one long book, and the second half may be out and about by the time you read this. (Sagaphobes please take note: Evaluate the size of the story as well as the number of volumes into which it is divided, and remember that the market for \$29.95 SF novels is modest for everybody except L. Ron Hubbard.) I hope so; I want to see how the pioneers work out, and also what happens when they make contact with the State starship, which is still in orbit around the gas cloud, its sentient computer trying to recall the mutineers to their duty. (Sentient computers not only do argue, but not being subject to intoxication or larvngitis, they can go on arguing much longer than merely biological entities.)

Before the story breaks for the intermission, Niven has told a briskly paced, scientifically sound, and thoroughly absorbing tale, with his usual large element of disciplined zaniness. Larry Niven is not mad; he can tell a hawk from a handsaw. What he can do with either one when he decides to run with it, however, is another matter. The book also has some first-class characterization, as Gavving the young hunter and the Scientist's apprentice known as the Grad mature under the weight of responsibility suddenly dumped on them.

Robert L. Forward, The Flight of the Dragonfly. Timescape/Simon & Schuster, \$7.95 trade paperback: Baen Books, \$3.50 mass-market paperback. Forward is the author of two novels of alien contact—Dragon's Egg (Del Rey/Ballantine, \$2.95 paperback) and this one. Together they make him a thoroughly welcome addition to the ranks of working scientists (Hughes Research Laboratories) who are also. SF writers.

The alien flouwen are ameboid water-dwellers in the ocean of one planet of a double-planet system around Barnard's Star. The two planets are so close that periodically the gravity of the uninhabited one draws the shallow ocean of the flouwen's homeworld into a single gigantic wave. When they are not reproducing, eating, or meditating, the flouwen surf down this ultimate wave.

Meanwhile, a human expedition is on its way toward Barnard's Star, on a one-way trip aboard the starship *Prometheus*. Once they arrive, they deploy a specially designed airplane, the *Magic Dragontly*, and enter the atmosphere of the flouwens'

homeworld Eau (French for "water").

The human-alien contact starts off with a certain amount of confusion; the flowen are hard to recognize as sapient beings, while they think the human beings are pets of the sapient computer that operates both Dragonfy and Prometheus. Eventually mutual comprehension, respect, and even liking are established—which still doesn't keep the flouwen from nearly killing their human friends by accident, when they interfere with the humans' efforts to return to Prometheus after Dragonfly crashes.

Forward has done an all-around good job with Flight. The flouwen are a delight, the technology is provocative (particularly the main computers "motiles"—self-contained units so small that the women can wear them in their hair), and the pacing varies but never lags—the fight to "swim" Dragonffy up the wave to a precarious rendezvous with the rescue shuttle is a real cliffhanger. The human characters are also nothing if not entertaining; one may not believe in Elizabeth "Red" Vengeance, who converts the \$61 billion fortune she made from asteroid mining into cash so she can look at it before she heads for the stars (recalling Scrooge McDuck's 12 cubic acres of money), but one would rather like to meet her if she did exist.

Please, Dr. Forward, can we have some more?

David Drake, Cross the Stars. Tor, \$2.95 paper-back.

We are getting more from David Drake, who takes us back to the universe of Hammer's Slammers (Ace, \$2.95) in this book. Ten years after Alois Hammer made himself President of Friesland, Captain 'Mad Dog' Slade of the Slammers is returning to his home planet Tethys, which he left 20 years before to become a mercenary. On the way, he has lost all the men who left Friesland with him to a variety of enemies, human and allen. He reaches Tethys to find that an old enemy of the Slade family is about to have his nephew put under guardianship, which will inevitably be followed by his assassination and the rival's rule over Tethys.

Any resemblance between Drake's plot and The Odyssey is quite obviously intentional. One can entertain oneself by picking out the parallels—the bubble houses are the lotus-eaters, the entity known as the Terzia is Circe the which, and so on. One can be even more entertained by Drake's story, which is packed full to bursting with ingenious ideas and scenes of fast bloody action. Packed too full, really—Drake has a habit of throwing things into his books

by the double handful, so there's no way he can develop all of them adequately.

Cross the Stars will still hold the interest of military-SF lovers. It also manages to say a few telling things about leadership (as Slade cobbles together a moderately effective force of pirates and traders out of a shipload of storm troopers), the responsibilities of command (when Slade puts himself into the mind-machine link an alien starship uses for its ftl drive, one that almost invariably drives the linked mind insane), and the different attitudes toward force of an ambitious politician (who thinks guns merely need to be waved) and a professional soldier (who knows they have to be fired by men who know how).

Lewis Shiner, Frontera. Baen Books, \$2.95 paper-back.

I doubt if I was the only one surprised to discover that Lewis Shiner's Frontera is a first novel. It's not only generally well-written, but the characterization is so superior I started off by wondering if "Lewis Shiner" wasn't a pseudonym for an experienced writer, possibly from outside the SF field. However, I have been satisfied that there is a Lewis Shiner and that Frontera is really his first novel, which makes Mr. Shiner a rather remarkable writer.

The novel is laid in a well-drawn post-collapse society, where the multinational corporations are slowly piecing things together again in place of the defunct national governments. One of the things being pieced together again is a space program, with a particular eye to "rescuing" the settlers of the Martian colony of Frontera, abandoned during Earth's time of troubles.

The real purpose of this revived space program, however, is to pirate the discoveries made by the mutant children of the colonists, particularly matter transmission and how to manipulate antimatter. When Americans, Russians, several factions of colonists, and the children themselves are all on the spot and fighting, the action becomes so fast and furious that I dely anyone to stop turning the pages until the book is finished.

The odds are very much against mutations occurring so fast or so usefully as Shiner has assumed, but every SF author is entitled to one impossibility, and Shiner does not exceed his quota. Even if he did, one could be reconciled to it by the

strength of his characterization.

Shiner has the rare and mature perception that a vast number of vices are compatible with the ability to do useful work or indeed be a hero. He also understands that it is not a case of "Once a hero, always a hero"-as the deterioration of Curtis, the leader of Frontera, indicates. Lena, the Russian cosmonaut who is willing to sacrifice her crew to prevent a war; Reese, the aging American veteran of the first Mars landing who wants to see his daughter and ends up as a voluntary guinea pig for interstellar matter transmission; Kane, the programmed corporate mercenary-none of them is either a cardboard hero or the equally cardboard villain who emerges from adolescent disillusignment. Shiner has even managed to avoid defining anyone as "good" or "bad" in terms of any current political fashion-a blessing to readers and reviewers driven to the point of terminal ennui by the results of this kind of self-censorship.

Shiner has, in short, done his homework about his fellow human beings, and done it in time for his first novel. This may not earn him sainthood,

miraculous as it may be, but—John W. Campbell Memorial Award, anyone?

James White, Star Healer. Del Rey/Ballantine, \$2.75 paperback.

James White, The Escape Orbit. Ace Books, \$2.50 paperback.

James White's Sector General stories of an interstellar hospital treating a multitude of different species are a good example of problem-solving SF in almost its purest form. The latest book in the series is in the established tradition.

Dr. Conway has to solve a number of medical problems, each with social consequences for the species involved. One alien race, for example, is unable to develop much of a civilization because a reflex developed as a defense against an aquatic predator causes them to become violently destructive whenever they gather in large groups.

At the same time, Conway has to cope with the small-group politics of Sector General Hospital Twelve and a crisis in his own career. This time the crisis is the beginning of Conway's training as a Diagnostician. These elite doctors can deal with several different species because each one carries imprinted on his mind the total knowledge and personality of a doctor from that species. This state of minds has interesting consequences for Conway's personal life. . . .

Incidentally, while the Sector General stories are White's most popular creation, medical problems aren't the only kind he's interested in solving. In The Escape Orbit, the problem to be solved is the escape of a group of human POW's from a prison planet where they are held by the alien race known only as the Bugs. Like the Sector General

stories, there is fine spare prose and excellent characterization, but there is also knowledgeable handling of military detail and a really brilliant presentation of low-tech solutions to high-tech problems. A small masterpiece, which deserves to be much more widely read.

William K. Hartmann, Ron Miller, and Pamela Lee, Out of the Cradle: Exploring the Frontiers Beyond Earth. New York: Workman Publishing Company, \$11.95 paperback.

The same team that produced *The Grand Tour* (Workman Publishing Company, 1981) has now returned to produce this excellent study of the possible course of the exploration and settlement of the solar system. The book follows the same effective format as the earlier volume: a text accessible to both the general and the technically trained reader and a lavish array of superb astronomical paintings by Miller, this time with the addition of work by co-artist Pamela Lee.

Hartmann is a determined proponent of space exploration and the use of the solar system's resources, and balanced in his judgments on such questions as the possibilities of life on Mars. Where his text may raise eyebrows, if not hackles, is in his insistence that international cooperation should be the only road to space. I would like to share his hopes that the international political climate will improve (or can be improved by joint space efforts) so quickly that his insistence doesn't amount to a prescription for no space exploration at all. Unfortunately, it's impossible to be that optimistic, and going into space with the present national sovereignties will do far less damage than not going at all.

Frank Kelly Freas, *A Separate Star*. Greenswamp Press, \$14.95 paperback.

It's just possible that Frank Kelly Freas is no longer the only world-class SF artist. However, he's certainly the senior, most articulate, and (judging from my own experience) most charming of a group that certainly wouldn't exhaust the fingers of one hand.

He's also a thoughtful man—about technique, SF and art in general, and professional ethics, to name only a few topics covered in the essays that make up the text of A Separate Star. Not to mention interesting vignettes of life at the edge of the Great Dismal Swamp and how the SF community rallied around the Freases when Polly developed cancer.

And of course the artwork. Kelly doesn't need unqualified reviewers maundering about his talents, but it is worth noting that the color reproduction is considerably superior to that in his *The Art of Science Fiction* (Starblaze/Donning, 1977 and now out of print).

A beautiful book.

Patti Perret, *The Faces of Science Fiction*. Bluejay Books, \$35 hardcover, \$11.95 paperback.

Anyone who doesn't already have an "Odd Volumes" shelf in their book collections should open one for Perret's offering. This very good photographer went around the country, taking super b blackand-white pictures of 55 SF writers and soliciting comments, autobiographical or otherwise, from each one. Leafing through faces is rather like visiting a very well-attended SF convention, except that you can stay sober. don't have to shout to be heard. and actually can see the authors you want to meet without a horde of other fen in the way. . . .

On second thought, maybe this book isn't so odd after all. Certainly, comparable volumes on groups ranging from policemen to transvestites have been produced in large numbers; some have even sold in respectable quantities. Faces may be another sign that SF has finally arrived, at least on the same plane as those other groups. There are no doubt better places to be—but there are also worse, and any SF writer over the age of 35 can tell you where they are because he's been there.

Even in these days of SF affluence, though, it's unlikely that many people are going to be buying

the hardcover of this one.

Life in Space. Time-Life Books, \$17.95 paperback.

The old Life magazine undoubtedly had the finest photographic coverage of the U.S. space program from Mercury through Apollo; the new incarnation has been doing a very creditable job with the flights of the space shuttles. The best of both have been selected for Life in Space, along with coverage of Skylab and the Russian efforts, as well as a text that is one of the better concise histories of spaceflight currently available. The book is gorgeous to look at, and now that the shuttle is flying and a manned space station is in the works, it's no longer quite so depressing to remember how low spaceflight fell before it started to rise again.

# EDITOR'S INTRODUCTION TO: OUT OF THE NORTH A GIANT

by John Dalmas

We know that freedom does not come easy; we could wish that freedom is as certain as gravity, but in reality it is no more automatic than the birth of heroes. We end this issue as we began, with a tale of men ungoverned and free.

## OUT OF THE NORTH A GIANT

### John Dalmas

There come out of the north a giant. Teeth he had like knives, claws like more of 'em, and the breath from his mouth was like carrion in the sun. And he walked on his hind legs like a man.

That's what Vance and Purdy said. Me—I wondered. For if they'd been near enough to smell that breath, then how'd they lived to tell it? For another part of their tale was that it moved as fast as a great round boulder bounding down the mountain.

I didn't hear 'em tell it myself, or there's questions I'd of asked. Sure they must of seen something, and it weren't likely a coney nor yet a hare, nor even a bear brute; folks know a bear brute when they see one. And tigers be noisy enough with their thrumming that we know when one's about, and what's about.

Anyway, a giant wasted their camp and killed the other three men and all their horses, which was hobbled at the time. Vance and Purdy run off.



And why none of the five killed it weren't part of the tale.

I weren't about to leave my claim on its account. Nor was my neighbors, Egolfs and Glum Flynn. It be agin principle to give up the farms we was making—give land back to the wilderness. Besides, it'd been fifty kilometers off north, way t'other side of Bad River and the tule glades.

A farther off neighbor had left though—Gentle Tom, who I've seen pull a stump with his arms, with only the side roots chopped off. Was Tom to rassle a bear brute, my brass would be on Tom. (No, not really. I just be making a point: Tom be moughty stout.) But his woman were frighty. Shouldn't of married her in the first place, she's that frail. Likely to die on him first time he blows her up. A throwback to the oldy times, to those among the firstfolk what died carrying child, or birthing it, or swelled up in the legs and went bad. Or got gurgly lungs and coughed theirself to death.

Must of been bad days back then, even though they still had the machines they'd brought with them from old Earth, where folk was skinny in the limbs, and things was said to weigh lighter'n on Hardy's World, strange as that mought sound.

Anyways, Egolfs and Flynn and me held to our claims, but kept our guns by us in the field, and all stayed in my cabin by night, my stead being the center of the three, and my dog, Brutus, the biggest and most fierce.

I set aside my axe to take a drink from my skin, for though it were fall, and cold at night, the leaves was down and the sun were bright, and I was starting a sweat. My field were too thick to see far, the tree trunks being close together for so big. I weren't like some, to take land easy to clear. I

wanted the best of land, the kind that grows a thick stand of big stout hardwood trees.

I'd already ringed seven hecters, beating the girdle the sun through and the corn grow. Three more hecters and I could make good my stead claim and be wife-eligible. Then I'd go south and get wed. To Mary Lou, Bill's daughter, with legs and arms like tree trunks, a belly as big and hard as a brass still, and axe-handle wide across the hips.

'Cause there'd be a lot of snags to fell over the years, and stumps to grub. Even dead trees throw too much shade for proper crops, and shelter pounce cats looking for a lamb or a chicken. And there'd be younguns to birth and raise and learn to do.

Anyhow, I'd just hooked the water skin back on my belt and were reaching for my axe when Brutus, who'd been snoozing with one ear up, jerked up his head. I caught it out the corner of my eye and turned to my rifle while grabbing up my axe. It could of been a squirrel he'd yeared, but I doubted.

For a blink or two of time he listened, then got up and trotted off like he were going somewheres. I trotted after with old "Straight Shot," my moccasins rustling soft on last moon's fallen leaves.

Up ahead, Brutus started to bark, sounding like he'd cornered a bear brute, his voice raging, and I wondered if I were about to learn the truth about the giant from the north. But then I yeared a man-voice, and knew it were some stranger what Brutus knowed not, and the feeling with it were both relief and disappointment. For a man likes a bit of excitement and adventure, even though he wants not to be laid waste by some wild beast.

Nor the stranger neither, for I yeared him hol-

ler: "For God's sake, call off your hound, before I have to shoot him!"

have to shoot him!"

Well, that quickened my feet, and I were there

in a thrice.

When I'd thought, "It's a stranger," I hadn't realized how strange; a stranger stranger never I'd seen. Looking back now, I should've known. For on Hardy's World, those what believes in God don't so use his name, while those what believe not, why, why would we use it at all?

Anyway there he was, backed between two big buttresses of a rope-bark tree, where Brutus could come at him only from the front. And he had no gun—that were a feint, purpose to speed my feet. He had not even a knife, only a club drawed up ready to strike, and not much of a club at that.

Before I thought to call, or had time, Brutus went for him, bounced back as the club come down, and then back in agin. I'd never seen him go for a man afore. The man poked at his face and Brutus closed jaws on the club, jaws that'd daunt a bear brute, and had, and he pulled. He pulled so quick, the stranger was jerked out by him and let go.

"Brutus!" I yelled. "Back!" I put all my intention in it, leaving room for neither disregard nor one last grab. Step by step he backed off, a parlous growl bubbling in his throat, till three meters lay 'tween them. The hair twixt Brutus's shoulders and up his neck stood in a bristly ridge. He were a sight! Weighed more'n seventy kilos, out of Big Maud, by Bull Killer, and the pick of the litter.

The stranger sagged like his bones'd went to mud, and he leaned back agin the tree. His clothes was all of one piece, from neck to ankle, and his hair was cut close like a bear dog's fur, instead of a proper bob. And he was a tall one, the tallest

ever I'd seen, a meter'n three-quarters, I judged, and terrible thin, mought of been 100 kilos.

"Gentle Jesus!" the man said. "I thought I was a goner." That's the way he talked. "That your dog?"

"Right." I said. "You be lucky I were about. That be Brutus, no less, out of Bull Killer. He and his daddy pulled down a bear brute by theirself last year. Weren't hardly worth shooting when we cotched up."

"Don't tell me about it," he said, and give a shudder. He put his little hand to his forehead when he said it, and the growl out of Brutus took new life at the move. I spoke sharp, and the beast flattened on his belly, embarrassed.

"Who be ye?" I asked. "And what's yer business?" saving it bresk, there being that about him

I didn't trust.

"I came to warn you," he said. "There are a dozen vorash north of here, a dozen crazy yorash that hijacked my ship. If nothing's done about . . ."

I frowned and raised my hand, and his gob shut in mid-word, 'cause it were the hand what held the axe, and it afeared him.

"Wait," I said. "First your name, like a right man."

"Fermin the ver . . . ah, Fermin Jones," he said. A man with summat to hide, I thought, but his eyes wasn't evil, just shifty.

"Fermin Jones, I be Big Jack the wrestler, Sean's son."

"Big Jack," he said after me. I seen the name surprised him, I being near a head shorter than him. But he made no sneer, for without Brutus, gun, or axe, I still had twenty or more kilos on him, and doubt not I could squash his head with one hand.

"Next." I said. "what's a vorash?"

"A vorash stands about this tall," he said, reaching an arm's length overhead to show me, then froze like that, for Brutus's growl swelled up in his throat again. I had to go to the brute and raise my hand to him, which shut him off. Then I put down my axe, patted his head, and scratched round his ears, and slightly his tail-end tapped the leaves. But his een left not the stranger.

"So they be tall-two meters or better," I said.

"What else?"

"Closer to three meters," he answered, "teeth twice as big as Brutus's, and a claw like a cargo hook in each wrist. And totally carnivorous. Meateaters, that is, And sapient-intelligent, more or less-not dumb animals. They build huts, form clans and tribes, and make war. What it comes down to is, they do three things: they hunt, have lots of young, and kill each other.

"They're so bad, their planet is quarantined-off limits. No one's supposed to go there. If the yorash get established here, you people are in deep trouble. There are females in this bunch. They'll be dropping pups by the litter, and they grow to maturity in two years. Instead of a dozen, you people could have half a hundred ravenous monsters in your backyard in a few years. And with humans to fight, they probably won't fight one another much, especially since these are all from one clan.

How come they here?" I asked.

"Um. Well-first of all, uh, I'm an undercover agent for the galactic patrol. And I . . . " "What be that?" I asked. "An undercover some-

thing for something."

"A constable. You understand constable? Marshal?" He seen I didn't. "A lawman," he said. I nodded, "And I went to Threllkild's World becauseit's a terrible thing to even think about, but the story was that someone had been capturing yorash and taking them off-planet to exhibit in zoos on

some out-league planets!

"So I went there to look around and ask questions. And the next thing I knew, a dozen yorash
had grabbed me and taken over my ship. And
made me bring them to the nearest world where
they could live and that was fairly wild. They
planned to kill me, once they got here, but I tricked
them and escaped. I'd seen farms over this way
before I landed, so I hurried south to warn you."

I understood not all he said, but enough to get the gist of it. Likely it weren't all true anyway, but I knew now what the giant were, and that there was a dozen of 'em up there. I tried to catch those

slippery een but they slid away.

"What smell have they?" I asked.

"Ugh!" said he. "Like a straddle trench on Sorrel's World. Bad. They've got musk glands."

"And hunt as a pack, these yorash?"
"Pretty much. But when they're looking for herds,

they scatter or send out scouts."
"Well then, I yeared of 'em. One of 'em jumped

some trappers over north."

"Um. Did they kill him?"
I shook my head. "The opposite; he killed three of them, and their horse beasts. Two got away and

brought the tale."
"You mean one of them attacked five of you?
Killed three and ran off the other two?" He looked

shook by that. "Did they have dogs? Your people?"
"Nay. They was fur trappers. They'd not have

dogs with them."

"Hm-m. Dogs would be helpful; dogs like yours." He pursed his lips. "And the yorash know there are humans here. They're likely to move on you. When was it they killed your people?" "Three days past. No, four. Vance and Purdy, that got away, come through the next day—hit some farmsteads over south and spread the tale. Then Gentle Tom, what lives there, come by and told us what he'd yeared."

Then a thought come to me. "When were it you

run off from them?"

His eyes drifted off and he began to tally on his little fingers. "Five days," he said.

"What took you so long?"

"I traveled mostly by night; it was too cold to sleep except after the sun was up. And I moved slowly; in your gravity I must weigh a hundred and twenty kilos." He seen I understood not. "My body weighs about half again as much here as I'm used to. Slows me down and tires me out.

"And without the sun to guide me, I followed creeks, assuming they led south, more or less. I knew the mountains were to the north. But the creeks curved around a lot, and I had to detour

around sloughs and marshes.

Then his voice went doleful. "You got something

I can eat?"

I should of realized. The man had no weapon and no skill; he'd not of eaten on the trail, except happen some berries or such. I called Brutus to heel and we went to my cabin, where I fed the man.

Not all to once. First some dried apples, their blue skins all puckered but the flesh sweet. And after a little bit, spuds. Later yon some sardo bread with syrup, and later still a cold roast dove.

Atween, we talked. He'd crossed Bad River the night afore, and near perished with cold. Lucky he were that the season been dry and river low. Then the sun come up, and he'd kept walking to dry off and get warm, until he yeared my axe.

After he ate the dove, he dozed, and I let him be awhile. At length I roused him, which were not easy, called Brutus to me, and we started off for Glum Flynn's field. In a few words I told the tale to Flynn. Then we found Egolfs and went off south to round up more men. It weren't likely to be no frolic getting rid of them yorash.

Twere a glad surprise to find Gentle Tom back, a giant of a man only half a head shorter than Fermin, and surely a 180 kilos. He'd gave his wife back to her daddy as not fitty for a border farm.

He said he'd come along, grabbed his gun, and whistled in Bull Killer. Then, with Fermin gnawing on a heel of sardo, we went about and gathered up eight of Tom's neighbors, this tract being well settled and not just outliers like Egolfs and Flynn and me. They even had cattle now.

Fermin told about the yorash agin, giants indeed, 'tween two and half, three meters. Lank, said he, but fierce strong, could tear a man in pieces.

Maybe you, I thought, but I weren't so sure about me.

And they had short fur, but their land ben't never cold, only maybe a little chilled sometimes when it rained. They hadn't no weapons but clubs, what they throwed with dead aim. What they used best was their fangs, and two big wrist claws to pull things in close where they could fang 'em.

After that we all set and parleyed over whether to go on south and gather more men. That's what Fermin counseled, but after he'd ate some more he fell to sleep, and when he woke up it were already decided. Next morning early, Buster, Marty's son, would take the women on the horse beasts and drive the cattle over the Piney Hills trail to Sweet Grass Valley. We'd send the dogs with 'em, all but

Bull Killer and Brutus, to protect 'em, case of varmints or maybe some scout of the giants were about.

Once over to the Valley, Buster were to gather whatever men were willing and able, and leave within a day or two. They could follow our trace.

I were the leader, that being my nature. And I

deemed we'd do better, us twelve, than a mob in killing yorash. There'd be less mixup. But if the yorash was to scatter, we'd need more men to trail em; the trackers ought to be by threes, naught less, which could take a slew of men. Fermin weren't too happy 'bout this plan. One yorash had beat five men and killed three of 'em, and we was going out about even. But the giant took 'em unawares; they hadn't knowed what it was or how bad. And they hadn't no dogs. All that was different now.

So 'bout daybreåk, eleven good men, plus Fermin, Bull Killer, and Brutus, set off on a nice easy trot, traveling light, each man carrying a sleeping robe of water hare pelts, a belt pouch of dried meat, one of dried berries, and another of cartridges.

plus a belt axe and skinning knife.

Not to despise Fermin, but he were no man for Hardy's World. We even took a horse beast for him so he wouldn't slow us. Even though it mought well be the death of a good beast, from what we

yeared of the yorash.

First thing we had to do was find the giants. And Fermin couldn't show us the way cause he didn't know how, even was they still there. So what we'd do was follow the trace of Vance and Purdy's folk, which was less than a quarter-moon old, about eight, nine days. That weren't likely to be hard, cause they'd no doubt followed the old trail through the glades, it hadn't rained since, and they'd had horse beasts, shod at that, which left plain tracks.

We waded the Bad River at Sandy Ford, the water colder'n a fur trader's heart, holding our gear up overhead, then warmed ourself agin by running on the trail.

We kept trotting and sweating, chewing a little dried meat now and then, and happen a few berries. Fermin got saddle sore. He complained not, but I could tell by the way he sat and the pained look on his face. Weren't made for Hardy's World, all right. Watching him, I better understood what the firstfolk had borne with, especially after he told me he were pretty husky and strong for an Earthman.

After a while we got into the tule glades, where the scape be half open with marshes and wet meadows and laced through with slow little creeks. Sloughs be here and there, and little ponds and pools, with timber atween and on islands humped out of the marshes. The fur trail was blazed and easy followed, winding about to keep to drier ground as much as mought be.

It be known as fine fur country, with hundreds of colonies of water hare and beaver, their reed mounds standing on the edges of the deeper creeks and pools, and many water cat and otter to hunt 'em. Vance and Purdy's folk would have made their camp just t'north of the glades, where the land starts sloping up to the ley Mountains. From there they could range along the whole length of the glades without miring their horse beasts, then drop the reins and go into the wetlands afoot to set and tend traps. It be a nice way to spend the trapper's moon—that season when the nights be frosty and critters' coats thick and prime but the country ben't froze up hard yet.

"Fermin," I said, "you told 'tweren't never cold

where the vorash come from. Know they to make fire?"

"I don't think so. It would say so in our compuwe'd know about it if they did. And it does say they eat their meat raw. Really they're animals, not men. But they can reason-figure things out."

"How come they to take over your spaceship?"

"Uh, well," he said, "they, uh, they knew about spaceships-knew they came from other planets, that is. I'm not sure who told them; maybe it was an oral tradition-word of mouth passed down from the time of the old study team. Anyway, I was questioning some of them when they jumped me and told me to take them to another planet.

I could smell that he lied, "So you know their language then," I said.

"Uh, yeah. Well, not a whole lot, but I can get by with it. More or less. There's different dialects." "Good," I said, "you can talk to 'em for us."

I'd just finished saying it when there were the boom of a rifle, and Bobby, Bass's son, fell backward in the trail. It took us total by surprise. There weren't no cover where we was, so we all hit the dirt. Fermin was off his horse so quick! I hadn't thought he were so nimble. The shot hadn't come from far-a patch of trees some 60 meters off.

"Spread out!" I snapped. "Al, Barney, you and me'll watch careful up ahead and shoot anything that moves. The rest of you keep low and move out

to the sides."

"What do you think it is?" asked Tom.

"It's got to be a giant," I said. "No man around here'd do that. Must of got a gun from Fermin's

ship.

I saw a movement then, a gun barl and part of an arm from behind a tree, and two of us shot the same time. Splinters tore from the side of the

trunk and there was a yowl. Brutus started for it then; I called him to heel, and Tom heeled Bull Killer, not to waste them.

Guns ready, we hadn't no more than got up when there was another shot, from heavy timber across a pool to the west, and Fermin grunted and went down. None of us seen the gunner, but we all shot in that direction to put him to cover.

"Flynn," I yelled, "you and Egolfs with me! Banney and Al, look to the wounded. Tothers get the one what shot last." Then I run toward the first ambusher, reloading as I went, Brutus trotting alongside. "Flank the giant," I said to Egolfs and Flynn, and they angled off. When I was close, it stepped out from back of the tree, its gun raised, and Brutus charged. I went to snap off a shot, and for the first time ever, old Straight Shot misfired. The giant shot an instant afore Egolfs, and Brutus went down.

Egolfs's bullet knocked it back a step, which is all the reason Flynn missed. I dropped Straight Shot and drew my axe as the critter charged me, its good arm cocked to strike with its hook-claw. I went for it, and the arm started its blow. I struck with the belt axe, taking it just below the elbow, and we crashed together and went down. I had just time to get a forearm under its jaw to hold them big yeller teeth away while I tried for my knife with t'other hand. I felt and yeared the thud as Egolfs clubbed its head with his rifle barl, and the big bodw went slack.

"You all right?" Egolfs asked.

"I think so," I said. The critter stunk, all right. I crawled out from under and looked off to the west, where the other giant had been. I yeared a shot, and then another, but I couldn't see naught.

"Fermin never said they had guns," Flynn complained.

I went to Brutus and knelt, but the life was gone out of him. I give his ears one last rub. There were another shot then, but still I couldn't see naught, so I went back to Bobby and Fermin.

Bobby laid dead where he'd fell, took through the heart by the first shot. I didn't know whether the giant were a natural good marksman or just

lucky.

Fermin were lungshot, the air breathing in and out through the blue hole in his chest. His skin had a blueness, too. Barney come up with two pads of moss he'd rinsed the dirt off of, and laid them on the bullet hole, front and back. Then, while he held them in place, I cut a strip offen Bobby's shirt and tied them on.

We yeared two more shots farther off in the woods, and I got fidgety, wondering. We'd lost one good man and one of our two dogs already, plus Fermin was wounded bad. But he were wide awake and seemed in no pain. He was talking calm, though not very loud.

"I don't suppose you've got a cigarette," he said.

"Cigarette?

"Never mind. I've got some confessions to get off my mind before I die, Jack."

I nodded.

"First, I'm no lawman; I'm a poacher and smuggler. A poacher is someone who goes around to different worlds and takes animals he's not supposed to, and takes them somewhere where he can sell them for good money.

"I went to a place called Threllkild's World and captured twelve yorash. They didn't hijack me and I can't talk to them. I just landed, ran up my commast, turned on the force shield, and waited for a pack of yorash to show up and investigate." I followed only part of what he were telling

me—there was words new to me—but I interrupted not. He were too bad hurt, and I wanted to let him get it all out. I'd ask questions later, if there was a

later.

"The commast stood up above the shield," he said, "and when, after a while, a pack appeared. I let go with a sound bomb that knocked them out. I went out and shot them all with knockout shots, and used the cargo handler—a machine—to load them into a cargo module that was modified to haul animals."

He were sagging some now, his voice weaker.

"Then I took off, but before I'd gotten far—maybe ten or twelve parsecs—I developed abnormal feedback in my drive and knew I had to set down somewhere fairly soon. I checked the computer for the nearest system with human inhabitants—here and came out of hyperdrive.

"I didn't dare use landing mode—I couldn't trust the drive for that—and just came in on a flat angle into a marsh at about a hundred kilometers an

hour.

"When the water and mud had run off the glass and I'd gotten my breath back from restrainer shock, I didn't have power of any sort, not even electric. I made a quick check, and it wasn't any of the simple-to-fix things, and I'm no engineer. But I did know that the locks on the cargo modules were electric and would have deactivated. All that was keeping them closed was residual magnetism in the seals, which wouldn't last long. In maybe a day or an hour, a heavy push or kick would open them, and there'd be a pack of mad yorash running loose."

He chuckled a little then, but not like 'twere funny.

"Now, I told you some lies before, but not all lies. Threllkild's World is quarantined, and the reason is that the yorash are considered a pathologically dangerous combination of intelligence and sheer murderousness. So the next thing I needed was a laser rifle and sidearms. But would you believe! The goddamn lock on the weapons locker opens with a command from the console! And it was dead! No electricity!

"Can you imagine? That next ship I buy won't have a crazy damn lock like that. I'll guarantee

you."

He seen then the unlikeliness of any next ship for him, and begin laughing, which started him to cough. I thought the coughing mought finish him right then, but if his body were weak, he weren't. When he'd quit coughing and spitting blood, he smiled weak at me, his face sweaty now. His voice weren't hardly a whisper when he started talking again.

"You guys are good people," he said. "I'm sorry I brought down trouble on you, But I brought you more than trouble. I brought four dinotheres from Prinz's World, a heavy-gravity water-oxygen planet like this one. Big animals, furry, with a nose like a long arm or a thick snake. Bought them legal, too! They're tame-domestic. Used for carrying and pulling. Yours. I give them to you."

He began to cough again, strangling, and when it passed, he just laid there with his eyes shut, saving naught. I felt bad about him; I finally found out I liked him. After a minute he coughed some more, and I took his hand and give it a little squeeze. He went to choking and strangling, and turned on his side to throw up, but died afore he hardly got started.

I stood up and saw Whitey and Al coming with a stretcher. They was shirtless; their shirts was part of the stretcher. Two others was walking with them: Flatnose Mike with his rifle slung and one arm tied agin his body, and Gentle Tom with his gun ready and another across his back, watching behind them looking grim. I seen naught of Bull Killer. and from Tom's face. I wouldn't.

It was Kootch in the stretcher. "Where's Char-

lev?" I asked.

"Dead," said Tom. "We'll have to go back for him."

"And the giant?"

He shook his head, his face even grimmer. So the one giant had got away, with his rifle. I knew now where the giants had got them. The rifle we'd took from the killed yorash was engraved "Wilfred Sykes," the make we all carried. So they'd got the weapons of the three killed trappers, and was lucky enough and smart enough to find out what they done and how to use 'em.

Al and Whitey'd put down the stretcher and I knelt by it. Kootch's eyes was shut and there weren't no pulse. He was shot in the chest. I lifted an evelid.

"Dead," I said. Tom nodded.

So we'd lost three fighting men plus Fermin, and another out of action. And the giants lost but one, unless the one what run off was bad wounded. Them having guns and us not knowing it had made the difference.

"You're one gun short," I said to Tom. "Where be t'other one?"

"Charley's? Out there with him."

"Get it!" I said. "We don't want the giants to get it. They got two now."

He nodded and started off, "Barney, Al." I said, "take the stretcher and go with him. Whitey, go

with 'em and give 'em cover."

Now we knew; they'd not surprise us like that again. But what was next for us to do? We could wait for more men. But if twenty or thirty more showed up, the vorash might run off and we'd have naught but trouble finding them all. And they had only two guns we knowed of, while every one of us was armed.

While we waited, I had a good look at the dead giant. It were a he-brute, maybe two and a half meters tall, with arms as long as my whole body. Hands was shaped like a man's, but long for their width. On each wrist were a big claw shaped like a hook but summat sharp on the inside. The teeth was like a bear brute's, except the corner teeth was longer.

And armed, and man-smart, and mean. Naught we wanted for neighbors.

When we was all together agin I had our dead put in half a meter of water and weighed 'em down with a waterlogged length of tree trunk. They'd keep till we come back for 'em, cold as it were.

Then we went on ahead, alert, ready to start shooting or hit the ground. We'd not need to find the yorash, I thought; they'd come to us. Mought be they'd lay in ambush and rush us from close quarters, so we kept knives and axes unstrapped in their sheaths-we'd each fire once and draw blades.

Were Fermin right, they'd started with twelve, and ought to be eleven now while we was eight.

Seven able-bodied. But we was seven riflemen while they was two. I hoped.

But naught of us questioned should we be doing this, for these be deadly savage critters, to be cleaned out afore they multiplied.

As much as we could, we kept to the open. Tom rode the horse beast now-'twere his-and from its height he could better spy anything laying in wait in the dead and brittle grass ahead. Course, he were also the best target up there. It were only a short time afore we seen two platforms made of saplings and branches, lashed in trees ahead, well up towards the tops, and it seemed like they must of been built by vorash. I never yeared of people doing ought like that.

The two trees was opengrown and branchy; easy to climb. So we went to 'em, and with a boost from Tom. I started up one of 'em. Several croakers-carrion birds-flapped their brown wings and

flew up from the platform.

There were carrion there. I knowed by the smell. But what I found were a surprise for sure-a dead giant. A she giant, bloated some but still too firm for the croakers to open up yet. I could easy tell what it were killed her, for the claw and teeth marks were of bear brute.

I looked over to Whitey, who were climbing t'other tree twenty meters off, and waited till he got to the platform. He waved his hand in front of him as if trying to fan stink away, and made a

terrible face.

"What be it?" I called.

"A dead giant," he answered. "Gutshot. I reckon he be the one what killed the trappers, and one of 'em got him afore it were over."

So there was nine of 'em instead of eleven.

"This one here's killed by a bear brute," I said.

"She's laid out with hands over her chest. Happen the giants be religious and put their dead in treetops for their gods to find."

"This'n be the same," said Whitey. "I bet they'd not like our being up here like this."

That, I thought, they wouldn't, and clumb down.

Now they seemed more to me like deadly enemy men instead of savage beasts, but I could see no other end except to kill 'em all. I wished Fermin

had let 'em be on their own world.

But here they was, and just now I needed to get their attention. So on the ground agin, I struck flint on steel in my fire striker, catching the sparks in a wad of dry grass, and lit off the grass at the base of my tree, while Whitey done the same by his. It begin to burn slow, the breeze pushing it north. We all backed off south some thirty meters and lit a whole line of 'em across the tongue of dry ground from the marsh on one side to that on tother. White smoke rose up; the yorash was sure to see it.

The fire was burning the dead grass off the whole

width of the tongue.

As soon as we could, Whitey and me went back through the thin ashes to the trees. With rifles slung, we clumb agin into the bare branches, where

we could see and be seen a good distance.

"Tweren't long afore we could see yorash coming on a good trot, out of the timber some two hundred meters north. Nine of 'em, all right. There were shallow standing water twixt us and them, where the fire would stop and burn itself out, maybe a hundred meters ahead. They come on, stopping far enough back that they was out of the heavy smoke. One raised his rifle, and I thought, here's where we learn how well they really shoot. Till then their shooting had been at fifty, sixty me

ters range; at a hundred fifty it'd be harder. They wasn't experienced, and probably didn't even know

to allow for range and trajectory.

I yeared a bullet click against branches, followed by the boom of the rille what sent it. There were another boom. I yeared naught of the second bullet; it were probably aimed at Whitey.

"Don't shoot back," I called to him. "Let 'em

come closer. Wait till I shoot."

The fire had reached the little stretch of water and was burning itself out now. After a minute or two the yorash come on toward us, two with guns, the rest with axes or clubs. At a hundred meters they stopped at the water. The two with guns aimed agin, and I got as much behind the trunk as I could, although it weren't very big around up where I were.

Whitey looked at me, but I called "not yet." It were risky, but I wanted 'em closer, where we could really waste 'em. They fired and naught happened. Then I started chopping at the vines what held the platform, and Whitey seen and did the

same.

They shot agin, and bout that time the platform partly fell away and dumped the giant body off. It fell, sliding and bumping off lower branches to the

ground.

We could year 'em yell then, and like a small mob, all nine come running at us, splashing through the shallow water and then the ashes. We drew up, and at about sixty yards let fly. I shot one of their riflemen down and Whitey the other. The others come on, and from the grass behind us come a whole little volley, and four more went down. Of the six down, four got up agin and all turned tail.

I'd already thumbed in another cartridge, and fired agin at a rifleman what'd got back up. This

time he stayed down. Others was shooting agin too, and my but them big critters run fast! Took a lot of killing, too, but even so, only four of 'em made it into the timber.

Five of their people lay out there on the ground, but I were disgusted to see that both rifles got carried off. Near as I could tell, of the four what

got away, at least two was wounded.

And none of us had got touched this time. So we'd won this battle, and I couldn't see how they could win the war after this one, unless we just quit and let 'em go off somewhere and breed.

We went around then and made sure the ones

laying out there was dead.

Still. I weren't feeling all as good as I mought.

Dumping that body out of the tree was what set 'em off and let us kill that many, but it weren't the kind of thing that sets well with me. 'Twere like messing with somebody's grave.

It were late afternoon now. We went on to the timber and in amongst the trees, carrying our rifles ready, hammer back. Spite of all, we were took by surprise. Not by gunfire this time; two giants jumped out at us from back of a big windfall, right in close. Over its fallen trunk they come, and one went down at once with two balls in her chest and one in her face. Tother swung his war club, though shot in the neck, and down went Mhitey. I give him another shot that went in under the arm, but he swung agin and down went All. There was a couple of more booms and down went the giant, dead as can be.

Both of 'em had dried blood on 'em; they'd been wounded earlier.

And that left just two. The most dangerous of the pack, cause they was the survivor type and had guns as well. I wondered were one of 'em

female. A mated pair or a pregnant female was most dangerous. If they lost theirself in the far outback

Whitey were dead, his skull crushed like a bird's egg. Al's arm were broke and so was some ribs on that side. I knowed now why the body in the tree weren't mauled and tore up worse than it were by the bear brute. These were powerful critters and hard to kill. I be willing to bet that there be a dead bear out there somewheres, killed by a vorash; a she-vorash at that.

And now we was just seven left, out of twelve, two of us stove up. It were time to council again. And not there in the timber; get to talking and we mought get slipped up on and jumped. So I give the word and we went back to the opening, picking up dry wood along the way, and built us a fire back far enough that we couldn't smell the vorash what we dumped off the platforms.

The sun were low now, and the air taking a chill to it. The sky were clear-no threat to rain-so we decided to make camp right there in the open. We gathered more wood, to keep fire up, and then more still cause I decided to make point fires a little ways out, to light things up for the watchguards. We worked at a trot, so we'd be out of the woods afore dusk

It'd been a long day. We'd started at dawn, covered bout fifty kilometers, lost five dead and two busted up, and killed eight giants. Wouldn't none

of us be the same agin.

The two giants left would do one of two things: come after us when it were dark, or run off. If they was both he-brutes, or shes what weren't pregnant, they'd probably attack; there weren't no more hope for 'em on Hardy's World, with no chance for vounguns. But if they was a mated pair or one was pregnant, seemed to me they'd run off—try to start a new tribe, far from any humans.

We all agreed on that.

"Tell you what I think," said Tom. "If'n they don't come at us tonight, I say we waits till more folk come, with dogs. Then we tracks down the last two giants and kills 'em, and that's that."

I didn't like it, but afore I could speak, Hard Egolfs, who usually says little, spoke his mind and mine. "Too dangerous to wait," he said. "Could be three or four days afore more folk comes up. The giants could be clear out of the territory by then, into the wild back. And it could rain and wash out their spoor so no dog could track "em. It could even come an early snow. I say we goes after 'em, come daylight."

But Tom stood his ground. "There's two of 'em, each with a rifle. They could shoot and run, shoot and run, keeping always to cover. I say we waits for more folk and for does."

"All right," says Egolfs, "then let all what's too frighty stay behind, and all what's got guts go

after the giants come sunup."

I didn't want my two best men in a fight that might leave one or both out of action, so I stepped in with an edge to my voice.

"Ben't no question of frighty," I said to Egolfs.
"No man here showed yeller today," Then I turned to Tom. "Egolfs is right about the danger of waiting. But we can't go hunting giants with two cripples along. So Tom, I wants you to start back with the wounded—you and Flynn and Barney—first thing in the morning. Or stay here if anyone gets hurting too bad to travel. The wounded ride the horse beast. Egolfs and me will track the giants."

"Too dangerous," said Tom. "They can jump

you. And then, with you dead, they can follow and waylay us somewhere. We all got to stay." "You're part right," I told him. "They could am-

"You're part right," I told him. "They could ambush us. We'll all stay long enough to build you a couple of lean-tos here in the open, or get 'em started anyway. Then you can stay here and wait, while the able-bodied takes turn about, watching. We'll stack up a good pile of firewood for night fires. But that's as far as I'll put off following the viants.

"Egolfs and me will stay on their spoor and leave a good trace ourself—blaze trees, break twigs. When help comes up, they can easy follow us, rain

or no.

"Send along half a dozen good men and dogs. That's all it'll take. Two or three ought to be enough,

but half a dozen makes it sure."

Flat-nosed Mike grunted something like a laugh.
"That's if the giants don't come busting in here

tonight. It's getting dark."
"Right," I said. "Mike, you hurting too much to sleep?"

"I'll probably sleep afore morning."

"All right, you take first night watch with Tom. One watch off north and east; you, Mike. Tom watches south and west. You'll have the watch till the Fish stands on his tail in the south sky, then wake up Flynn and Barney. The moon be in the last quarter, so Egolfs and me takes the watch when it rises."

There weren't no more argument. We lit the fires, chewed more dried meat and fruit, and rolled up in our sleeping robes. Regardless of any danger, I doubt any but the hurt had trouble sleeping. Like I said, it were a long day.

On our watch, long toward morning, a tiger thrummed maybe two, two and a half kilometers off north at the edge of yearing. A little bit later we yeared a far off shot from the same direction. They was on their way out of the territory, all right. Well, we'd catch 'em. Most critters could outrun a man easy on the short run. But weren't hardly nothing could keep our pace on the long run—sixty, eighty, a hundred kilometers.

Meanwhile, what were going through their minds out there? Were they frighty, big and fierce as they were? One thing I were sure of: they wanted to live, and they wanted their kind to live, same as

us.

Not long after, the dawnlight come. The dark kind of thinmed a little over east, then silvered behind the treetops off across the marsh. Pale yellow come behind it, and by then the night had paled to the top of the sky. In the west, most of the stars was shining yet, but in the east only the bigger ones, like silver specks. I seen Egolfs stand up, stiff and silent in the cold dawn. He weren't an easy man to know; we'd been neighbors and strangers for near two years. But now I felt a tie with him, a likeness of feeling, a friendship, and I knowed he felt the same, even though he weren't like to say anything bout it.

I stood up too, and paced the chill out of my legs, putting a stick or two fresh on each point fire. Not that the point fires was needed now, for already I could see five times farther than an hour

afore.

On the center fire I laid several more stout pieces, for 'twere the coldest hour, and them sleeping lay like wheel spokes, "with their feet to the heat," as the saying goes.

When the last stars were fading in the west, I waked up Tom to come along and cover us, and

Mike to watch camp. I told 'em of the gunshot Egolfs and me'd yeared, but beyond that it were

no time of day to talk much.

Egolfs and me took belt axes, leaving rifles in camp, and trotted off for the timber. The grass was crisp and white with frost, and where water stood shallow, 'twere skinned with ice. We cut a slew of saplings and young poles for building leantos. When these was dragged up, we felled a few dry snags of shingle ash, long and slim, crowded to death by stouter kin, and dragged 'em in for firewood.

I wondered if, far off in Sweet Grass Valley, men was gathering now to start off with dogs and guns. A two-day march 'twould be for them, and the

sooner begun, the better.

The sun weren't far up when Egolfs and me rolled up our sleeping robes, filled our provision pouches from them of the dead, took rifles in hand,

and said good-bye to our trail mates.

Trailing went slow at first, though helped by having yeared the gunshot and knowing they went north. From tracks in soft ground, one of the giants was considerable smaller than t'other—a she or a youngun, and I was willing to bet a she. After an hour or so we seen where they scraped up lots of dead leaves and stuffed 'em in the hole under a root-tipped bur-nut tree, to sleep warm. Weren't thirty meters from it we found the dead tiger, laying yellow and spotted like dappled sunshine. Shot in the face, from so close it were powder burned. A haunch were hacked off, so they had a belt axe with 'em, or mabe two.

Not long after, tracking got easier, cause they'd hit a pretty good river, some fifteen meters wide and too deep to see bottom. Seemed like they wanted not to cross it; water too cold. I guessed. So we picked up our pace to a trot, taking turns, one watching for sign, tother for the giants theirself and leaving sign of our own. Snap a brush here, blaze a tree there. Sign weren't hard to find, cause the ground were soft in lots of places. And we didn't worry too quick if we saw none, cause they just followed the river anyway.

Finally we come to a grassy valley at the foot of the first foothill ridge of the Big Icy Mountains. Here we come to where two branches had joined to make our river. The righthand branch were smallest, and the giants had crossed. It looked shallow enough, so I crossed too, holding my gear overhead, with Egolfs ready to cover me with rifle fire.

On t'other side, the stones was dry where the giants come out, though shaded by a bush, so they was probably an hour or more ahead.

Their spoor led up the ridge, through woods, and tracking went good cause there was good leaf cover, leaving scuff marks from their feet. They'd went right over the top and down t'other side, where there were a ribbon of grassy meadow in the draw. I walked out of the timber just in time to meet a she bear coming out across from me. If it weren't for the cub with her, we mought of bypassed each other. She raised up to peer at me—maybe never seen a man before—and I stood still as could be till she dropped down and charged. I fired point blank, and from behind me Egolfs's rifle banged in my ear. She went down skidding, stopping bout five meters short.

I just stood there then, scowling at the dead sow while the cub run off. The giants likely yeared the gunfire; they'd know we was following 'em.

Anyway, we rallied and went on. The tracks went up the little dry creek there; the meadow ended and we was in timber agin. We kept our een open to not be took by surprise, but I really thought they'd not try to waylay us. Their best hope was to escape, to lose us, and they knew not—I hoped they knew not—that there be just two of us. And they was long-legged and wild-living; they ought to feel sure of their ability to travel far and fast.

It mought come down to who give out first. I was sure it'd never be Egolfs and me. And if they

played out, then they mought try for us.

We kept going all day, breaking a little every hour or two to lay on a high point while we chewed dried meat and dried berries. Once we got into the worst ravine I ever thought to see, full of down timber. I hated like poison to go in there. Good thinking by the giants it were; they could step over trunks we had to belly over, and belly over trunks we had to either pick our way around or find a place to crawl under. When we come out of there without being ambushed, I were pretty sure they was only trying to get away.

I wished we could let 'em, but it'd never do. Were it just one, and a known male, we mought to

let be, but it weren't.

By midday we'd got much higher, up into pine woods, and by sundown was above the pure pine, to where larch and spruce was mixed with it. I'd never seen larch nor spruce afore, but I'd yeared of 'em enough to know when I seen 'em. The larch was bare now, their slim needles a fiery red carpet round their feet.

We camped cold and dry that evening on a poor stony ridge top a hundred meters off their trail, where they couldn't hardly find us in the dark if they come looking, unless they could follow a scent. And I wouldn't hardly expect something with its face two and a half meters from the ground to have that good a sniffer. Even so, we each took a turn watching for the first few hours, which was the likeliest time for them to come hunting us. After that we just laid there, with no fire, the cold wind blowing through the skimpy trees, and both slept the best we could. We needed the rest.

Water hare robes be the warmest you're like to find, short of something bulky and heavy, but that night were well below freezing. Part of the night! laid awake from cold, and part of it asleep, and it seemed a lot of the time! I were about half and half. I remember wondering how the giants was faring, having naught but short fuzzy fur, and them from a place where 'twere always summer. And up here in the high ridges there weren't even lots of leaves to rake up for bedding.

Come light enough to track by and we was on our way. The yorash probably started an hour earlier, or maybe more, to gain time on us, which were exasperating, but we made good speed a lot of the time, trotting, cause on slopes, needles slide

underfoot and leave clear marks.

I got to worrying about meat, ours getting low. Covering ground like we was, we kept eating away on it. So when we come out in a meadow and seen a doe deer, I up and shot her, the sound of the gun echoing through the ridges round about. This surprised Egolfs, but I told him to shoot too, so he shot into the air. By that time I'd reloaded and did the same, and he took the meaning of it and quick shot agin, and me right lafter.

That made five shots in the space of a few breaths. Now we not only had fresh meat, but if the giants were in yearing, which I doubted not, we sounded like a whole party after 'em. They'd be less likely to ambush us now, or so I figured, and I'd a lot

rather come on 'em from behind.

We quick carved plenty of good red meat into strips and draped 'em over our belts, enough to last three, four days. The whole thing took less than five minutes, and we was on our way agin.

That were the only thing happened all day, till late. They kept going higher and higher, like they wanted to put the Big Icies tween them and where they'd been. As if they knowed there be no men on the north side at all. In places, now, the tracking were slow, where the ground were gravelly and not much needles, or the cover mostly short bunch grass. Up and down we went, but more up than down, till the only trees left were spruce, and them getting shorter and less close together. We tired easier and walked slower, and hardly run at all. The air were not just colder; it were hard to breath. like it were thinner.

We could look off up the big ravines and see where they come out of great coves above. The coves was like stone bowls, hundreds of meters deep and open on the downslope side, with patches and even fields of snow on their shadowed walls. But mostly they was dark gray rock, and patches of rusty red where something growed, with little white streams like far-off ribbons running and falling out of 'em.

They looked beautiful, and cruel, and deadly cold. I begin to feel like the chase weren't far from over. For the giants was naked and without fire.

and from everlasting summer.

Finally we was following along a ridgetop where the ravine below clumb steep to the cove above. Much of the ground were open, and where there were timber, the trees was stubby and stout. I almost missed where their tracks took off angling toward the creek that clattered below down rock stairs.

We passed through a belt of trees on the lower slope, but the bottom were meadow, with here and there an old spruce or two, bout half of 'em dead and bleached silvery gray. I went to cross the creek on a blowdown when there come a shot from the timber on the ridge in front of us. I felt it the same time I yeared the sound. I'd just bent to steady myself when the bullet hit the rolled up sleeping robe slung over my back. I jumped back and off when another bullet smacked jim to the log.

Egolfs had already took cover behind another blowdown, and I hopped over it beside him. We looked up into the timber but saw naught but

trees.

"Egolfs," I said, "they ben't just sniping. One of 'em be up there trying to hold us down while t'other's somewheres about looking to flank us. They been watching for us and know we be just two."

He nodded.

"So let's break for the timber behind us. Then they'll have to cross the creek theirself to get at us."

"All right."

"Both to once," I said, "you that way and me this. Go!"

We broke for it, running crouched. There was one boom and right quick another, and then we was in the cover of the timber on our side of the ravine, puffing. As I knelt behind a fat spruce, ready to fire at any sight of 'em, I yeared a giant call in a strange hollowy voice different from the yells we'd yeared afore. And they was words he called, strange words.

But they never give us a glimpse, and after we knelt there awhile it started to get dark. We couldn't tell if they was still in the timber opposite or if

they'd clumb out of the timber and on up the mountain.

Anyway, tracking were done for the day, and when it'd got summat darker, we crept back a way in the shadowy dusk and slipped off through the trees, angling upslope towards the cove above. After a little the timber petered out, and we was in the lower end of the cove itself. The only cover there was patches of scrub on the bottom and lower slopes.

Stars was starting to show as we snuck to the downslope side of the nearest scrub patch. It were matted and thick, so thick 'twould be dusk beneated at the start of the start

We lay there chewing on fresh venison, and raw though it were, it were a welcome change from dry. We was about out of dried berries, and finished what we had.

After a bit I could year the slow breathing of Egolfs asleep, back in his dark sprucey cave a couple of meters from me. I looked up at the sky. Even in my robe and out of the breeze I shivered; it weren't going to be the best I'd ever slept.

Soon it were full dark, and the night so clear 'twere beyond belief, with twice the stars I were used to. From somewheres out there the firstfolk come; somewhere out there were Earth. And Fermin had flew about out there and visited lots of 'em, lots of worlds, and I knowed I wanted to do that too. Took me by suprise, but I wanted it more than any farmstead or anything. Fermin left me that too.

And somewhere out there were Threllkild's World. I wondered if the yorash knowed that-if maybe they was huddled somewhere looking at those same stars and feeling desperate homesick.

I waked a few times from cold, and then waked up agin and it had gone cloudy. Snowflakes was drifting down. I crawled out of my robe and moved back in the sprucey cave with Egolfs.

Toward morning I slept hard, and it were bright sunshine when at last I woke feeling stiff from cold, and tired. I peered out: there were half a meter of snow, but we was dry in our hidey hole. I poked Egolfs and he muttered something, and neither of us much wanted to go out in it, yorash or not. But we couldn't spend the winter there, so I got out of my robe and rolled it up, and Egolfs likewise.

We didn't know if the giants was one kilometer away or half a dozen, but suspected they'd stayed the night in timber. We went downstream to the first blowdown what bridged the creek, ready to take cover quick, and crossed moughty careful not to slip.

Then we skirted round the timber to the uphill side and run onto the tracks of the vorash in the snow, striking off up the mountain. It'd still been snowing when they'd come through, cause considerable snow had fell in their tracks. Seemed like they mought be quite a piece ahead, but somehow I knowed 'twould be over by midday, one way or another.

We waded up the steep open ridge, following in their path. Our legs being lots shorter than theirs, it was good to have the trail broke for us. Sun or not, it were hard cold, but we was warm and to spare when we reached the top. From there we could see south over many kilometers of snowy mountains and far off foothills, to flatlands at the edge of seeing, and it were all white.

Twere going to be a hard trail back, but we'd be able to have fire. I was moughty glad I'd shot

that doe deer, too.

Close by on the north was high peaks, our ridge crest climbing up to meet 'em, giant tracks mark-

ing the way.

We followed, our rifles slung cross our backs with our bedrolls, our hands in our pockets for warmth. The ridge became a rim tween great coves to east and west, then curved round tween one of them and a greater cove to the north. We seen there what looked to be a great tilted wall of ice beneath the snow, cause they was big open cracks in it that went down to who knows where. Below it in the bottom of the cove were a big lake with a great thick crescent of white ice sticking out of the lake ice. I never seen nor dreamed then of any-place what looked so savage and cruel as that mountain, nor so beautiful.

But the accident we come on was in one of the little coves, big though it were, that faced south-east. By the look, one of the glants had fell, and rolled and slid down the steep slope a long ways, and over an edge. The other looked then to of set down and followed, sliding on his seat. I looked and Egolfs looked, and then we looked at each other. I give a shrug and set down and followed, and Egolfs likewise. I didn't see any other way.

The edge, when we got there, weren't near as bad as I'd feared it mought be, just a rim with the slope steeper below than above, and over it we went. It got a little wild then, but the snow being deep and loose, it weren't deadly, and when the

slope finally tailed out below, we just sort of slowed down and stopped.

We hadn't more than got up when there were a shot from not far off, and we both flattened back into the snow. But the shot sounded strange, and

there were a terrible howl right after.

Of cover we had none, except snow. I looked at my rifle. It were okay to shoot; somehow there weren't no snow in the muzzle. Then I peered about to see where the giants mought be. The tracks led to the foot of a low rock face bout eighty meters off, where there were a big patch of matted spruce twice as high as me, like we'd camped in might afore.

Even naked to bullets, it were time to close and finish it. I jumped up, run a few meters, and dived down in the snow. Then Egolfs come up by me, and we took turns. Whichever of us were down, he laid ready to shoot at any sign of movement a head. We did this a few times until there were only twenty-five meters left, and hadn't naught happened. So we just both got up and walked ahead, cold-clumsy fingers ready on the triggers. If I'd of shot, 'twould of took me a minute or more to reload, my fingers were that cold.

The tracks went into a gap in the scrub, one to two meters wide. I could see into it, back bout ten or twelve meters to a shallow cave-like hollow in the cliff. I didn't much want to go in there. If I could of, I'd of lit off the scrub and smoked 'em out, but there were too much snow on it to carry fire, and I'd of had to warm my hands anyway to strike one.

Then I seen something laying part covered with snow at the opening of the gap, went to it, and raided it with a foot. A rifle with a barl split and curled back; the poor devil fired it plugged with snow.

I told Egolfs to stay back. If anything jumped at me, I'd drop down and he were to shoot over me. 'Twas the only thing we could think to do. Then I started in.

It were a long ten meters—finger on the trigger, not hardly breathing—and finally I come to the end. And that's what it were, the end, the end of the chase. To one side of the shallow cave, the bigger giant sat crosslegged with the head of the littler on his lap. He were stroking it. She weren't even moaning. Her face were shredded by the explosion, and she were surely blind.

I just stood there, staring, seeing every bit of it. Him stroking, his red-brown een steady on me, waiting. The feet of both of em was swelled and split, and I knowed they was froze. Thaw em and they'd rot off with gangrene. I yeared Egolfs come in behind me; his breath kind of hissed in at the

sight.

T pointed my rifle. The big one just kept looking and stroking. "I'm sorry," I told him. "Awful awful sorry." Then I pulled the trigger; the he-giant fell backward with the top of his head gone. "I really truly am," I said, and shot the poor blind she-giant.

I hoped they knowed.

The yorash weren't all what had broke out of Fermin's spaceship. The dinotheres was loose too, the four of 'em browsing on brush and just general enjoying theirself. Shaggy they was, and big—the biggest stood tall as the tallest yorash. We never did get 'em weighed, though there were talk of it, but I wager they'd of gone six, seven ton.

And tame, like Fermin said. Took a little rounding up—they wasn't all that eager to be penned—but

after we got a stockade built, we baited 'em in with hay we hauled on sleds all the way from Sweet Grass Valley. The whole countryside were in on it. Then we learned to get on 'em and steer 'em about, and finally drove 'em to Tom's settlement.

You ought to of seen 'em the next spring. We could get 'em to wrap that long nose round a stump, and up it would come, roots popping and

dirt flying!

I never did marry Mary Lou, for 'twere that summer the space trader landed in Grass Valley, the first ever on Hardy's World, and I talked 'em into hiring me on for bread and board to do whatever needed done—mostly cleaning and cargo handling. And learned to write and figure, and more after

that.

On Peng's Station I joined the Survey Bureau as a surface crew security guard, seen a lot of interesting worlds—some of 'em more interesting than I liked—and made sergeant first class.

Then, here at Przbylski's Station I yeared bout you fixing to go to Threllkild's World to learn more bout the yorash and see if they's any prospect of

civilizing 'em.

Well, maybe you can see why I want to go along. I'me felt for years now that I killed a kind of man and woman in that cave back home. Deadly dangerous they was, and savage—they'd proved that afore ever they left their world—and they was goners anyway, but I'd like to be along in case anything can be done for their kinfolk.

After all, us humans started out pretty savage, too—can be yet, sometimes—and we've come a long

way. Mought be they can, too.



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